Environmental Education in the Mt. Pleasant School System:
Using the School Grounds and the Surrounding Town for Learning

Bonnie K. Waninger
May 1, 1989
LA 406
"The essence of life itself is constant learning."

—Michael Link
Table of Contents

I. History of Environmental Education and Resource Use
   A. Early Ideas
   B. Formative Beginnings in the United States
   C. Camping Education
   D. Standardization and Funding
   E. Environmental Education Today

II. School Site
   A. Inventory & Analysis
      i. Spatial Variety
      ii. Elements to Observe
   B. Site Concepts
      i. Site Concept 1
      ii. Site Concept 2
   C. Study Opportunities

III. Yorktown Community
    i. Environment Inventory
    ii. Study Opportunities

IV. Appendix
    A. Thesis Proposal
    B. Sample Environmental Education Curriculum, Yorktown, Indiana
    C. Educator Survey
II. HISTORY OF ENVIRONMENTAL EDUCATION AND RESOURCE USE

A. Early Ideas

History implies an event that has taken place in the past whether that past is a hundred years ago or one minute ago. To assert that a movement began in a certain year in history is to say that the movement was officially recognized on that date and not that no person had previously considered the ideas associated with the movement. Environmental education is the name given to a culmination of movements and, before that time, of ideas reflecting the theory that education or learning takes place wherever there is a student or person willing to learn.

John A. Comenius, 1592-1610, advocated sensory learning and experiential education. The learner should use his senses of smell, taste, touch, and sound in addition to his sense of sight to experience the world. Although man relies heavily on his sense of sight, blind persons have shown us that our other senses are equally effective when used.

In the 1700s, Jean Rousseau first publically identified the "teachable moment" as a moment when children are curious about something and are most open to learning. Children are naturally curious about their world, and Rousseau promoted the idea of taking advantage of a child's curiosity to further learning. According to Rousseau, books teach students to use the reasoning of other people rather than to develop their own reasoning. He believed education should be sensory and rational rather than literal and linguistic.

Johann H. Pestalozzi (1746-1827) emphasized direct, first-hand experience to generate learning. He wanted educators to walk quietly beside the student and let nature teach children that man is but a part of the system and not the center of the system. Pestalozzi practiced nature study long before the "beginning" of the nature study movement (Lyons, March, 1988).

B. Formative Beginnings in the United States

In the United States, our history of resource use parallels the development of environmental education. The frontier philosophy of settlers exploited the superabundance of resources. Using their European technology, capitol gain became as important as conquering the environment. Perhaps because the east had been tamed, in the period from 1830 to 1870 easterners in the U.S. noticed that the American frontier was rapidly decreasing and the beginning of the conservation philosophy took hold to save the wildness of the west.

Through their writings, Thoreau and Emerson explored the wonders of nature and the impacts of man. John Perkins Marsh in his 1864 book Man and Nature also focused attention on these subjects. The evolution of the village green into city parks was a noteworthy mark in the conservation of open spaces in our cities. Landscape architect and planner Frederick Law Olmsted, Sr. (1822-1903), with a commitment to social democracy, contributed to the development of cities and regions, of a national park system, of the U.S. Forest Service, and to the beginnings of preservation conservation.
The establishment of Yellowstone National Park in 1872 marked the beginning of the conservation/preservation battle. The father of conservation, Gifford Pinchot, advocated a wise use of resources through a balance between economics and preservation. John Muir along with Emerson and Thoreau took a philosophical approach to resource use. Aesthetics and preservation were more important than economics and man should take only what he absolutely needed. Olmsted's preservation conservation lies somewhere in between these two. For instance, green space in a city should be preserved, however the form and character of the space could be changed to suit the needs of the users.

C. Camping Education

The Great Depression brought conservation and environmental education together in the 1930s and 40s with the inception of camping education. Government programs designed to put people back to work, such as the C.C.C. and W.P.A., pushed forward in state and federal parks throughout the nation. Park facilities were upgraded or new parks were created as conservation received a huge push forward. At the same time, individuals like Dr. Lloyd B. Sharp began advocating summer camps to help students falling behind in normal school activities. Reluctantly, schools began sending students to summer camps even though most of these camps were recreation oriented.

Research by Dr. Sharp in the late 1920s and early 1930s for Life Magazine tied camping education to the school curriculum. Life had designed a Fresh Air Fund to send underprivileged kids from the inner city to summer camps and asked Sharp to evaluate their program hoping for an endorsement. Unfortunately for Life, Sharp found their camp regimented and gave an unfavorable rating to the program. His rating prompted the few private camping education facilities to reevaluate their goals and focus on increasing learning through recreation rather than just recreational fun. Sharp's contributions to camping education had long-term impacts and many of which are still in effect in environmental education today.

Sharp stressed teaching as a small group process with individualized programs thus avoiding the chaos and non-educational atmosphere associated with large group recreational camping expeditions. Decentralized camping with smaller groups of students allowed dependence on each other for all group activities and an atmosphere more conducive to learning.

Sharp coined the title "camping education." He felt focusing on educational benefits while camping would tie the program more closely to the school curriculum. Year round camping during the academic year was as important to Sharp as summer camps. If children camp during school time, they are more likely to view it as an educational experience that is fun rather than as a vacation.

Leadership training for all administrators and teachers would help them feel comfortable in the outdoors before they added the additional unknown of curious children. If a teacher is uncomfortable, he or she is less likely to participate in a camping education (or environmental education) program or will apply rigid controls to students during the outing which curtails many teachable moments.

Sharp did not believe that the outdoors was the ideal place for all education. He recognized that some subjects or topics are best taught in the classroom while others are more understandable in the outdoors. A third group of subjects or topics needs the overlap of classroom and outdoor...
reinforcement. The important point was being able to recognize which was more appropriate and to act accordingly. L.B. Sharp defined outdoor education, a successor to camping education, as a "method" for learning as opposed to a separate subject or department within the curriculum (Lewis, 1975). Just as worksheets and lectures are methods for conveying information, outdoor education was an interdisciplinary method relating subjects, tailoring individual programs to individual students or groups, and recognizing that no two programs are alike (Lyons, March, 1988).

By the 1940s and 50s, experimentation with camping education was well underway and school camps were becoming an integral part of the curriculum. Dr. Sharp's 1947 research done at a national camp compared three week educational gains between in-class students and Life's camp. Academic scores between the two groups were nearly equal, however the camping group benefitted in areas of social living, cooperation, and tolerance of others suggesting the students could cope better in a society with an increasing population (Hammerness, 1980).

Sharp's study reflected positively on the ideas of American educator John Dewey who saw students treating school as separate from society when in fact, the school, where children spend the majority of their lives, is actually the child's community. To relate the child's school community and societal community, Dewey proposed unifying the two with a common element. He believed school should be taught indoors and outdoors with the outdoors providing the link to the societal community. Unifying the separation of school and society, of learning and doing, and of the child and the curriculum would produce a student who could deal with realistic concerns. Schools should teach of life's actual experiences with purposeful activity and should have teachers who know that growing leads to ever widening effectual control (Hammerness, 1980).

D. Standardization and Funding

As with all new ideas introduced to the school system, camping education underwent a period of standardization where administrators and educators rationalized its value to parents who did not quite understand why camping was important to their children's education. Manuals and guides were developed to serve as texts for teaching, and camping education changed to outdoor education and outdoor labs, names which sounded more acceptable for a school curriculum. L.B. Sharp was still a major contributor and helped to establish a national organization devoted to outdoor education.

Aldo Leopold, in his Sand County Almanac, stressed harmony between man and the land which he called "the land ethic". The 1960s proved to be a time of revitalization and innovation in environmental education as outcries raged against the human race's damage to the earth through misuse of natural resources. Revolutionary ideas about the carrying capacity of the earth became public. Garrett Hardin's lifeboat ethic compared the earth to life in a small boat and was similar to Adlai Stevenson's 1965 "Spaceship Earth" speech. In both cases, resources were limited.

Barry Commoner took another approach to viewing resource use. His "tragedy of the commons" discussed the use of publically owned resources, the air, sea, and groundwater for instance. Commoner's theory was that resources which are not owned are overexploited and eventually destroyed for short-term gains. Silent Spring, a novel by Rachael Carson, added to Commoner's theory as Carson told of the silent poison called pesticides entering our groundwater system via agricultural fields. Provoking concern for human life on planet earth, these people and others prompted the nation to show its concern for the
environment through organization of Earth Day, April 22, 1970, and through
government intervention with the Clean Air Act, the Clean Water Act, the
National Environmental Policy Act (NEPA), and the Council on Environmental
Quality (CEQ), a special group of direct presidential advisors that prepares a
yearly report on the state of the environment.

Educators felt the way to understanding and preventing resource
destruction was to develop an understanding of the interrelationships between
and among man and nature. In October of 1970, the National Environmental
Education Act rallied interest to a new high point with the Elementary and
Secondary Education Act, or Title III, providing funds for outdoor labs,
curriculum development, and staff training. Land Between The Lakes, a TVA
demonstration program between Kentucky and Barkley Lakes in Kentucky, operates
a youth station with unlimited government funds. Government agencies also
developed environmental education programs to use government lands as outdoor
labs. The National Park Service has NEED (National Environmental Education
Development), the Bureau of Land Management has "All Around You," and the U.S.
Forest Service has "Whole Earth Design." Environmental education became
education in the environment, for the environment, and about the environment.

E. Environmental Education Today

The environmental education of the 1980s is a drastically reduced version
of the resurgence of the 70s. Under President Ronald Reagan, Title III funds
were reduced, as was funding for most environmental programs. Although Title
III provided funds for setting up new programs and facilities, continued
maintenance and upgrading was left to individual school systems and tended to
be a first line budget cut item. Today's environmental education programs are
the result of battles between educators and school boards for funds and only
exist where a true belief in the value of the program and support from the
school system's taxpayers exists.

The basic assumption of environmental education states that good
information about the earth, its systems, and man's impacts will lead to
proper attitudes which in turn will lead to proper behavior (See Figure 1)
(Lyons, March 14, 1988). Contemporary societal influences on environmental
education include:

1. A lack of concern about the deterioration of the environment.
2. Urbanization and industrialization—the movement of people from
rural areas to urban areas and finally to suburban areas, places of
compromise.
3. Fast paced living which leads to short-sightedness—workers are
unable to visualize themselves as a part of the whole process and
begin to lose sight of the dynamics of systems.
4. Sedentary lifestyles from lack of exercise on the job and increased
leisure time because of mechanization and automation create people
with sedentary leisure activities.
5. Materialism as a part of mechanization allows people to buy gadgets
to make their life easier and thus to buy their recreation in the
forms of televisions and video recorders.
6. The disintegration of the family unit (Smith).

Environmental education counters this by providing a sense of community within
a warm atmosphere that lets children have experiences and make mistakes.
Environmental education teaches observation, a mental process which can be
taught, learned, and most importantly, transferred. An educator's most
important job is to create a self-propelled learner. Environmental education
is the study of our relationship to the environment and its natural cycles. The subject matter includes the natural environment, the artificial environment, the interaction of the two, the consequences of this interaction, and the judgement or values associated with the action and its consequences (Link, 1981).

Environmental educators strive to increase world awareness in people and to motivate people to work to make this world a better place to live; however, many people find difficulty in relating themselves to such a vast system especially those who see man as a force outside of nature. Traditional environmental education tends to be nature education rather than environment or surroundings education. Students are shipped to a "natural" environment which, although it has its own merits, feels similar to a vacation because the trip becomes a fond memory with no direct bearing on the student's life. A new direction in environmental education teaches students to look at familiar environments in a new way. Student examine natural areas as well as residential, urban, and agricultural areas to better understand their world. Environmental education becomes environmental interpretation which involves observation of detail and comparison of observations.

Establishment of an environmental education program within a school system does not require a major capital outlay for effectiveness under the new theory of teaching. The most effective and successful programs use the existing school site as the primary source of learning and the community resources in addition to cooperative regional and district plans as a secondary source. New buildings are not essential because schools already have indoor learning places. "The potential for developing environmental education facilities within the school grounds is only limited by the boundaries of imagination, resourcefulness, and enthusiasm (Ezersky, July, 1972))." The key is site management and the ability to use the strand approach to teaching which weaves strands of environmental information throughout the regular subjects incorporating experiences with inquiry.

Contributors to Environmental Education:
From nature study, environmental education draws an emphasis on an understanding of our ecological system—man, culture, natural environment. From conservation education, environmental education draws a concern for the husbandry of the system. From outdoor education, environmental education borrows the concept that such issues should cut across the entire curriculum. From citizenship education, environmental education draws social dimensions and a commitment to action. From resource management education, environmental education draws a technological point of entry to public policy change. (Schoenfeld, 1971)
Even though environmental education draws on many areas, it is still markedly different from its predecessors. Characteristics of the old and the new include:

<table>
<thead>
<tr>
<th>Predecessors</th>
<th>Environmental Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>compartmentalized</td>
<td>comprehensive</td>
</tr>
<tr>
<td>parochial interests</td>
<td>broader awareness</td>
</tr>
<tr>
<td>local</td>
<td>global</td>
</tr>
<tr>
<td>rural</td>
<td>urban</td>
</tr>
<tr>
<td>evangelical</td>
<td>ecological</td>
</tr>
<tr>
<td>resource-centered</td>
<td>man-centered</td>
</tr>
<tr>
<td>terrestrial</td>
<td>universal</td>
</tr>
<tr>
<td>biophysical sciences</td>
<td>social studies</td>
</tr>
<tr>
<td>technical impetus</td>
<td>public involvement</td>
</tr>
<tr>
<td>unilateral solutions</td>
<td>open-ended options</td>
</tr>
<tr>
<td>elementary education</td>
<td>adult education</td>
</tr>
<tr>
<td>print media</td>
<td>all media</td>
</tr>
<tr>
<td>business as usual</td>
<td>sense of urgency</td>
</tr>
</tbody>
</table>

(Schoenfeld, 1969.)

William Stapp, developer of the University of Michigan's environmental education program, one of the best in the country, defines environmental education as that education "aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward this solution.

Stapp further outlined four basic objectives of environmental education. These objectives were to help individuals acquire:

1. A clear understanding that man is an inseparable part of a system, consisting of man, culture, and the biophysical environment, and that man has the ability to alter the interrelationships of this system.
2. A broad understanding of the biophysical environment, both natural and man-made, and its role in contemporary society.
3. A fundamental understanding of the biophysical problems confronting man, how these problems can be solved, and the responsibility of citizens and government to work toward their solution.
4. Attitudes of concern for the quality of the biophysical environment which will motivate citizens to participate in biophysical environment problem solving (Stapp, 1969).
III. SCHOOL SITE

The Mt. Pleasant Community School Corporation in Delaware County, Indiana, is considered one of the finest county systems in Indiana. Showing its progressive nature, educators at the Yorktown Middle and Elementary Schools have chosen to push forward in the struggle for environmental education programs. Within the past few years, an environmental education committee has established and implemented an environmental education curriculum meant to be incorporated into the classroom at all levels (See Appendix B). Today, they are prepared to struggle for school site improvements to parallel this curriculum. This project is designed to use the existing school site and, to a lesser extent, the surrounding community for the purpose of environmental education focusing on land use differences. The educators are responsible for the strand approach teaching technique; this project deals with site management and educational opportunities.

A. Inventory & Analysis

i. Spatial Variety

Site management begins with an inventory of available resources. Breaking a site into smaller sub-spaces or, for our purpose, environment types gives a broader understanding of how the school site can be studied within the environmental education curriculum at the Yorktown schools (See Figures 2&3). The division between spaces is based on the way humans use the space.

Only thirty feet wide, the river corridor shows signs of stress from overuse. Trails above and below the natural levee are eroding; vegetation is dying back; and glass litters the wooded area. Continued stressing of the area will result in loss of it. A junk embankment created by waste material (concrete blocks, tar paper, wood, plastic, sawdust, old cars) from the original school construction has blocked the river channel causing stagnant water, an excellent study opportunity. The junk pile is still unstable and the safest way to reach the study area involves using the neighboring property where topography is not as steep (See Figure 4&12).

The school's sports facilities include four baseball and softball diamonds and a cinder track. The baseball fields are complete with in- and outfields, benches, bleachers, and chain-link fences. The soil is dry and cracked with scattered, sparse vegetative cover. The track is used for practice only with the interior area utilized for football practice. Wind erosion of the cindars has coated the surrounding grass. The bleachers to the north of the track near the river and their concrete slab are stable for now, but the bleachers are in disrepair and river meandering is beginning to cut the bank behind the bleachers (See Figure 5). A brush pile located on the track's northeast end is a safety hazard to curious children who climb it to investigate.

The immediate school interface with the site is void of vegetation other than exotic foundation plantings of evergreens and ornamentals which show salt and wind stress. Steep slopes surround the school offering a challenge to bicyclers and eroding from lack of cover and heavy water flow off angled building windows. Interior courtyards offer views of evergreen trees (See Figure 6). Parking lots are rarely near capacity during the school day.

The wide, open, grassy depressional space has large overstory trees but lacks new tree growth under one foot in diameter. Drainage patterns mark the minimal topographic change of this former flood plain now cut off from the
INVENTORY & ANALYSIS: SPATIAL VARIETY

Figure 3
main flood plain by road beds which are acting as levees. Both State Road 32
(SR 32) and Gaston–Yorktown Pike are heavily traveled. The ditch along the
base of the SR 32 levee is grassed but also contains cattails suggesting a
marshy soil. An overhead utility line parallels the central path which has
been slightly raised in elevation because the ground stays wet or is soggy
much of the year. Isolated erosion spots dot the area, especially under tree
canopies. A three feet diameter sycamore tree complete with one half inch to
one inch poison ivy vines is circled by auto tracks. Litter in the depression
is mowed over and reincorporated into the soil. Current use of this space
includes booth set-up during the Buck Creek Festival, foot traffic to and from
the school, and some recess recreation (See Figure 7).

Newly acquired, the woodlot has good under and overstory growth. The
steep topography was used as a trash dump (out of sight, out of mind) for
concrete blocks, water heaters, etcetera. A concrete post marks the highway
right of way limit while fence posts and, in some places, mesh wire fence
marks the old property line. Lack of understory vegetation delineates a path
through the area as boulders mark the area's former gravel pit status. The
hillslope shows foot traffic erosion that is clearly new. Bird and rabbits
frequent the area (See Figure 8).

The house which accompanied the woodlot purchase is used as a meeting and
storage room for contractors and architects working on the high school
renovation and no plans have been developed for its future. Junk litters the
surrounding yard which holds animal pens, spring flowers, and a leaf-covered
driveway. The brick retaining wall along the stairs and sidewalk from the
lower drive to the front door is collapsing from overburden push (See Figure
9).

A chain-link fence with three entrances designed to keep bicycles out
encloses the playground. Concrete slabs underlie much of the play equipment
to prevent erosion. Large, overstory trees shade the lot, but do not give
overhead enclosure to the space. Few young trees are present. Other than the
fence, no cushion blocks the playground from the road activity (See Figure
10).

Defining the property boundary along the eastern side of the sports
facilities, the border strip acts as a junk collection point. Vegetation
provides a noticeable microclimate although it is not deep enough to give an
enclosed feeling. The strip is mounded which increases its border effect.
Bicyclers have worn a break through the tree line and are causing erosion
problems at this point (See Figure 11).

Although not a part of the school grounds, the openland wildlife area of
the abandoned gravel pit is characterized by a mound and pit system. This
area can be used for educational purposes with permission of the landowner.
Succession is well underway and thorny trees, four inch in diameter, dot the
site. Currently, wildlife such as rabbits, birds, and deer inhabit the area
because forage and cover are excellent. Nevertheless, off-road vehicle use is
evident in tire ruts and eroded mounds. The area is secluded because the
topography and river corridor act as barriers (See Figure 13).

ii. Elements to Observe

The way humans use spaces is determined as much by site dynamics as by
intended or planned use. Certain specific elements within any potential study
environment should be inventoried as a basic starting point in the learning
process. These elements, soils, wildlife, vegetation, topography, and
microclimates can be inventoried in simple ways, such as differences in soil
colors in an agricultural field, or in more complex ways, such as flooding
Figure 11 (Left) & Figure 12 (Bottom)
Figure 13
impacts on soil formation, but the goal is to obtain an understanding of how these elements impact space formation.

1. Soils (See Figures 14, 15&16)

Soils in Delaware County are well-drained, loamy soils underlain by sand and gravel and are derived from glacial till, outwash gravel and sand, and alluvial deposits. Bedrock is Silurian dolomitic limestone. Specific on-site soils include:

Fox loam, 6 to 12% slope, eroded (Foc2)

An mid-upland soil, Foc2 occupies breaks and short slopes on terraces, kames, and eskers and is a loamy outwash underlain by sand and gravel at a depth of 24"-30". Native vegetation is mixed hardwood trees and the soil is well-suited to fall-seeded small grains, legumes, and hay crops as well as some corn and soybeans. Hazards include erosion and droughtiness in summer. This soil is well-suited to openland and woodland wildlife, but not suited to wetland wildlife.

Fox silt loam, 0 to 2% slope (FsA)

An upland soil, FsA occupies terraces and outwash areas with limy gravel 30"-40" below the surface. Native vegetation is mixed hardwood trees. Crops that can be grown on this soil include corn, soybeans, grasses, legumes, and small grains. This is an easy to cultivate, porous soil that may be droughty in summer. It is well-suited to openland and woodland wildlife, but not suited to wetland wildlife.

Fox gravely clay loam, 6 to 12% slope, severely eroded (Fxc3)

Fxc3 occupies breaks within terraces and outwash areas and is adjacent to streams. Depth to loose gravel and sand is 24"-30". Hazards include erosion, droughtiness, and gravel and cobblestones at the surface. It is suitable for pasture, hay, grasses, and legumes, but conservation practices are needed. This soil is well-suited to openland and woodland wildlife, but not suited to wetland wildlife.

Genesse silt loam, 0 to 2% slope (Ge)

On the Yorktown school site, Genesse soils define the one year flood plain. They are deep, nearly level, well-drained flood plains which have been formed from recent loamy and silty stream sediment. As a flood plain soil, runoff is slow due to lack of slope. Native vegetation is hardwood trees. Corn and soybeans instead of small grains can be grown because the annual flood gives the soil a high natural fertility. The soil is well-suited to openland and woodland wildlife, not suited to wetland wildlife.

Gravel pits and stone quarries(Gp)

Gravel Pits occur along streams and around eskers or kames. These areas are disturbed sites with a general classification because sand and gravel have been removed. The abandoned pits are excellent places for willows and woody shrubs which are used for cover and food for wildlife.

Miami silt loam, gravelly substratum, 0 to 2% slope (Mna)

Occupy high, flat areas on uplands, Mna soils formed on glacial till with a 7"-11" loess mantle. The depth to loose gravel and sand is usually 4-6 feet. Native vegetation is mixed hardwoods and the soil is well-suited to corn, soybeans, and small grains although erosion is a hazard. Mna soils are well-suited to openland and woodland wildlife, but not suited to wetland wildlife.
Figure 15

WILDLIFE SUITABILITY of SOILS

LEGEND

- Well-suited to openland and woodland, but not suited to wetland.
- Suitied to openland and woodland, but well-suited to wetland.
- Poorly suited to openland and wetland, but well-suited to woodland.
Miami silt loam, gravelly substratum, 6 to 12% slopes (MnC2)

MnC2 soils are found on ridges and slopes on uplands and till plains where the depth to loose gravel and sand is usually 4-6 feet. These soils were also formed on glacial till and have a loess mantle. Native vegetation is mixed hardwoods. Erosion must be controlled. This soil is well-suited to corn, soybeans, and small grains and well-suited to openland and woodland wildlife, but not suited to wetland wildlife.

Pewamo and Brookston silt loam, overwash (Pk)

Pk soils are a combination of Pewamo (60%) and Brookston (35%) soils. The Pewamo soils are a dark silt loam while the Brookston soils are an outwash. They are a recently deposited mantle of alluvium over glacial till in depressions in uplands, outwash areas, and terraces. Native vegetation is mixed hardwood, swamp grasses, and sedges. Sand and gravel is present at a depth of four feet. These soils are part of the ten year flood plain boundary on this site and wetness is a major limitation. They are difficult to drain because the water table is at or near the surface. Ponded water damages crops frequently. Pk soils are well-suited to corn, soybeans, small grains, legumes, and tomatoes, suited to openland and woodland wildlife, and well-suited to wetland wildlife.

Sloan silt loam (Sn)

Sloan soils are also part of the ten year flood plain on this site. They are recent loamy and silty stream sediment that have been deposited on low flood plains in depressional places along streams. Alkaline and noncalcareous, corn and soybeans are usually grown intensively on these soils. Native vegetation is mixed hardwoods, swamp grasses, and sedges. Hazards include wetness, annual flooding for short periods, collecting of excess water from other areas, and frequent overflow from nearby streams. Sloan soils are poorly suited to openland and wetland wildlife, but well-suited to woodland wildlife (U.S. S.C.S., July, 1972).

2. Wildlife

The study of nature and natural habitats calls for wildlife to provide the movement that children love to explore. Developed plantings for wildlife are the best way to keep wild animals on the site although this does not insure that the animals will be viewable. In Delaware County, three types of wildlife are recognized: openland, woodland, and wetland. In general, the county and this site are well-suited to openland and woodland wildlife, but the potential for wetland wildlife is low (S.C.S., July, 1972) (See Figure 15).

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite, pheasant, dove, meadowlark, killdeer, field sparrow, cottontail, red fox, and woodchuck.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, rail, kingfishers, muskrat, mink, and beaver (U.S. S.C.S., July, 1972, p. 33).
Current wildlife on the site habituates the river and its corridor, the east border by the abandoned gravel pit, and the hillslope on the newly acquired house site (See Figure 17). The terrestrial environment is currently limited to woodland wildlife, but has the potential for both wetland and upland (See Figure 15). Aquatic wildlife from the bordering West Fork of the White River provides an additional study area.

3. Vegetation

A significant component in the design and management of outdoor environments, vegetation acts as a space organizer as well as adds life and beauty to the environment. Even though we enjoy natural spaces for their softness and irregularity, plants added to built sites, especially institutional sites, are usually applied as decoration. Existing stands of vegetation not damaged during construction become grassy or canopied areas when the understory is removed as an aesthetic improvement gesture. The wild appearance of native shrubs on the well-groomed lot seems trashy and messy detracting from the desired austere image. Contrary to the belief that using plants solely for decoration, aesthetic enhancements can serve other useful functions. Plant size, form, and foliage type create spaces, screen views, and offer privacy. Environmental problems such as erosion control, temperature extremes, and lack of wildlife habitat can be solved with vegetation. Finally, vegetation unobtrusively manages human traffic flow and provides an ecological study area for the natural environment. Hardwoods such as oak, hickory, elm, maple, and ash are indicative of Delaware County vegetation.

Existing vegetation on the Yorktown school grounds fits into two categories: space defining and decoration (See Figure 18)

A. Space Defining

The linear wooded areas on the north and east sides of the site act as a screen for neighboring properties as well as provide a visual end to the seemingly endless turf. Inclusive of over- and understory vegetation, these areas are approximately thirty feet wide. They counteract vulnerability and provide security only when a person reaches a distance equal to the overstory's height. Upon penetration of the border, the screening effect vanishes due to visual adjustments to light changes. Space definition occurs in two dimensions, x and y. Three dimensional space definition is found on the school's newly acquired house site. The hillslope vegetation encloses enough area to form a woodlot space, however the steep topography is threatening and overrides the space's natural calmness.

Overstory trees add a ceiling to turf. Unfortunately, although the trees shade the spaces, their height in conjunction with the space size negates the enclosure and the security leaks out. Lack of young trees adds to this problem because canopies begin at least thirty feet off the ground losing the human scale.

B. Decoration

Especially in recreation areas, turf creates open space without volume. As in a desert, the space continues outward away from a person leaving him feeling vulnerable to attack or free from inhibitions depending on his point of view. The well-groomed, clean appearance contrasts sharply with the wooded and overstory tree areas where organic ground litter is common.
EXISTING VEGETATION

LEGEND
- Turf
- Exotic (Evergreen & Ornamental)
- Large Overstory Trees
- Woodland

Figure 18
In contrast to the majority of the site's native vegetation, exotic species, mainly evergreen and ornamentals, dot the school's tangential border area. Shrubs act as foundation plantings while trees break the monotony of brick walls and turf areas. Planting design does not seem to have been a major consideration in school site design; rather, the plants appear to have been a final budget allowance.

Excluding turf, vegetation covers approximately one quarter of the site; however, the linear nature of the woodland areas and clumping of overstory trees produces large, unfriendly, exposed spaces. Along with topography, vegetation becomes a space forming element with the type of vegetation affecting the type of space formed. Although the site has environmental problems—wind tunnels and erosion—no effort has been made to solve them where possible with vegetation.

4. Topography

Topographic changes are dependent on historical formation of the earth's surface and man's intervention with soil movement. Topography affects aesthetic characteristics, spatial sensation, drainage patterns, views, microclimates, functional use of a space, etcetera. The school site is quite varied in topographic changes (See Figure 19).

5. Microclimates

Microclimate impacts on site dynamics are negligible with noticeable variation occurring infrequently. Microclimates depend on the interaction of topography, vegetation, and structures with the sun and wind. Sun affects large, open spaces by beating down on people and small confined spaces by direct heating of space forming elements. Wind, especially where wind tunnels exist, coincides closely with structures that funnel or redirect the flow. Topographic changes change wind movement and create pockets of warm and cool air. Vegetation blocks or absorbs sunrays creating cool spaces under tree canopies. Wind is also slowed or dispersed as it passes through branches or around plants (See Figure 20).
River

The ripple/pool system provides both shallow and deep aquatic habitats to study. River action is forming a meander through erosion and deposition processes.

Natural Levee

Created by flooding, the levee forms a vegetative corridor along the river. Trails on top and at the water's edge show favorite walking paths especially for viewing wildlife.

Flood Plain

This ten year flood plain is good for recreation events although the gentle slope creates drainage problems.

Hillslope

The steepness of this area inhibited development and allowed vegetation to remain during school construction. Removal of vegetation in certain areas has caused erosion.

Upland

Placement of the school on the drier upland areas gives the building dominance over the site.

Depression

Once a part of the flood plain, this depressional area was created by the school fill and the artificial levees of the roads which bound it. All these areas drain into the depression causing the ground to be soggy much of the year.

Artificial Levee

Road fill created these levees which enclose the south end of the school site. Because the road is elevated above the depressional area, vehicles are not visually distracting.

TOPOGRAPHY ANALYSIS

Figure 19
B. Site Concepts

i. Schematic Site Concept 1 (See Figure 21)

Utilizing the existing site is important; however, improvements upon that site can provide a greater variety of learning opportunities. In accordance with requests from the educators at Yorktown Middle and Elementary Schools, Schematic Site Concept 1 provides a greater spatial variety for future study.

The current river corridor should remain unused by the school because of the high risk of soil erosion due to steep slopes and river meandering. Existing trails, especially near the water's edge, should be blocked with fallen trees to reduce foot traffic and prevent further erosion. Study opportunities present in the corridor can also be found in the wetland area to the east and in the area near the Gaston/Yorktown Pike bridge where the slope is not as steep.

The existing bleachers near the cindar track can be used as a temporary (or permanent) outdoor classroom until funds are secured for a shelter. The bleachers need to be repainted but otherwise appear to be in good condition. Bank erosion behind the bleachers can be controlled by deflecting water with fallen trees or brush. Because the bleachers face south, students would be distracted by the sun shining directly into their eyes. A light-weight canopy should be tied to the top seat, stretched out over the bleachers, and supported by poles. The poles and canvas could be temporary items simply by using metal poles set in concrete inside old tires similar to many school's outdoor volleyball nets. The canvas could be carried out to the site each time and easily attached by tying it to the poles and then to the bleachers.

The likelihood of the school system developing additional wetland areas is slight due to foreseeable liability difficulties and proximity to the river resource. Therefore, use of neighboring property to access school wetlands is recommended. Research into other schools with environmental education programs has shown little likelihood of mishap with wetlands especially if the students helped create them or were exposed to them from the time of their first initial contact with the school. Shallow-water wetlands with less than six inches of water might be a better alternative.

The existing woodland strip should be maintained to act as a windbreak and screen even if extension of the openland on the neighboring site is highly desirable. Because the woodland is not very wide, it would not inhibit movement of wildlife from one site to the other.

Although this soil is not well-suited to openland wildlife, openland vegetation and wildlife existing on the neighboring property which has the same soil suggests suitability. Carryover of wildlife should occur.

A short grass, mesic prairie would require high maintenance until established, probably in three to four years. Long term maintenance would require mowing or burning the prairie site once a year. Paths through the prairie could be mowed strips in designated spots. A prairie site should not be attempted without close consultation with the school's grounds keeping department.

As an extension of the prairie, wildflowers displayed in this interior courtyard could be observed from the building's interior through lines of windows peering out into this space. Maintenance would again be high during the period of establishment but would be reduced to mowing once or twice a year after that time. Flower species should include early spring and late fall blooming plants.
Summer classes can help maintain this small garden plot. The site allows easy access to tools stored in the house's garage and trees act as a windbreak without blocking the sun. A garden should only be attempted if specific individuals have been designated as caretakers.

The house is an ideal place for a nature center because it provides storage and display areas as well as an indoor "outdoor" classroom for rainy days. Large expanses of windows provide a woodland viewing area and the rounded glass corner could be partitioned off as a bird viewing area. Having a nature center encourages classes other than the natural sciences to become involved in environmental education because display and collection areas are ready-made spaces for creative writing and mathematics classes among others.

Expanding the existing woodland allows nature trails to be developed. Using half the potential area leaves room for continued use by the Buck Creek Festival and gives students the opportunity to compare what the site was to the new space. The extended woodland should be planted with seedlings possibly obtained in mass quantity from State nurseries. Planting with seedlings does not necessarily speed the development of a woodland, but gives students the opportunity to plant and care for "their" tree the entire time they are enrolled at the school. Trees can be put up for adoption when the student leaves the school. Camping could occur, however traffic might inhibit sleep or the wet ground could cause problems especially during the spring season.

ii. Schematic Site Concept 2 (See Figure 22)

Improvements take time to mature, so interim study areas are needed. Identifying those spaces which are existing now and will still exist when the new plan is mature allows educators to begin implementation of the environmental education curriculum in the outdoors. Student should be a part of the development of the school site. Studying environments should parallel observations of how those environments change over time. Schematic Site Concept 2 identifies those spaces that will not change and identifies additional spaces that can be studies.

1. Sites to be developed.
   A. Developing the house into a nature center should be a top priority. The house can serve as a base for all the other activities that will take place.
   B. The woodlot was requested by the educators as the first outdoor project to be developed. Setting up a development program could be done by educators and carried out by community volunteers and by students as a part of their regular environmental education program.
   C. A butterfly display area is an interim area to the wildflower garden. Species of flowers and some small shrubs could be planted/seeded and the area gradually developed into a full wildflower display. A step-by-step development of this area lengthens the intensive maintenance time, but gives more students an opportunity to take part in the creation of a habitat.

2. Interim study spaces.
   A. The sports facilities can be divided into two different habitats.
      i. The baseball/softball diamonds can be likened to a desert environment where plants are spaces farther apart due to lack of water. The most hardy species tend to survive in a desert. In our temperate environment, we call these species woods. To
truly appreciate nature study, one must learn to appreciate weeds as well.

ii. The track area can be considered a grass garden because a variety of species are grown here. Grassy areas are habitats for smaller, less noticeable animals we call insects or more likely "bugs." To find these creatures requires sitting or lying on the grass to bring oneself down to an observation level. The grass itself can be studied because our generic name "grass" covers a multitude of plant species which grow close to the ground or are capable of being mowed.

B. The playground is an area to study people patterns and the effects people have on their daily environment. Weathering of equipment and mapping of trails to equipment might give students a fresh prospective about their daily activities.

C. The grassy depression is a good comparison to the grass garden because it has a few overstory trees to provide shade and a wetter soil. Animals and plants in this area may differ substantially from the grass garden.

D. The school interface provides an area of study similar to an urban environment and is not an area most people recognize as a study opportunity. Human impact is readily noticeable and one must search for nature which is contrary to most people's view of environmental education.

3. Sites to remain.
   Sites to remain will not change from their present form and can be utilized immediately. They include:
   A. Wetland areas
   B. Woodland border strip
   C. Neighboring openland (with owner permission)
C. Study Opportunities

The automobile's impact on today's society is reflected in how we interact with our environment. The auto separates us from our environment and frames our view of it within a window. We tend to scan a view without really seeing it or becoming a part of it. Unless we feel we are a part of this view or a part of the environment, we will not feel responsible for our impact on it. The key to environmental education is teaching our children how to observe what they see.

In a wooded area, seasonal changes in vegetation are easily noticed at a glance (See Figure 23). Observation teaches children to look more closely at other aspects of vegetation. One tree in the wooded area may harbor other types of vegetation or may give clues to the animals which live in the vicinity (See Figure 24).

Snow offers a unique seasonal view of our environment because it produces patterns as it falls on objects (See Figure 25). When one learns to observe these patterns, he begins to learn about his environment. A bicycle left to rust in a wooded area can be used to teach children (See Figure 26). In art and mathematics classes, students learn about lines, curves, and shapes; all are present and visible because of snow. Without snow, the bicycle could still be used as a teaching tool. As it rusts, students can study the chemical process or can determine the rate of rusting and the factors involved in the process. Observation leads children to question and to that magical "teachable moment."

Observation on the Yorktown school site can be as simple as taking a photograph and holding a discovery session (See Figure 27). The photograph taken in the grassy area between the track and the hillslope has numerous learning opportunities. Things to be studied include:

- Microclimates
- Water outlets
- Human traffic patterns
- Building materials
- Soils and water content
- Vegetation
- Weather
- Grass hibernation

Figure 28 shows a leaf-covered slope with a sidewalk and stairs to a house entrance. Things to be studied include:

- Leaf decomposition
- Weight of soil
- Mortar and brick composition
- Vegetation—sun & shade impacts on the type of vegetation
- Insects and other animals
- Vegetation—root impacts on walls
- Weathering of the house

After observing objects in the photograph, children can go outdoors to the same spot and observe it. What do they notice now that is different? Reality offers sounds, tastes, and feeling whereas an image only offers visual clues. Discovery sessions prompt children to use all their senses.
III. YORKTOWN COMMUNITY

L.B. Sharp proposed an ever widening circle of study areas beginning in the classroom and radiating out to include the world. (In a even broader circle, one could include the known universe and beyond, but at this point in time, student field trips off the planet are not likely.) Sharp's expanding circles began in the classroom where students learned basic concepts about their environment. Next, they moved outdoors to explore their school site. In one class period, parts of the community in which the school was located could be explored. Day trips within the school's regional area would utilize the next level of available resources. The regional area would encompass the surrounding counties. To explore the school's state might require an overnight trip and to learn about the country of residence, the student might attend a week long camp. World trips, trips to other countries, occurred as students progressed up the educational ladder. Some language classes already use this circle; for instance, a spanish class might spend two weeks during the summer visiting Spain or Mexico (See Figure 29). Dr. Sharp's purpose in suggesting these resource circles was to project the idea that schools should utilize all available resources in teaching students.

i. Environment Inventory

The holistic approach to environmental education professes multidisciplinary curriculum teaching. Interrelating topics and subjects shows students reasons for learning, adding validity to schools. The main fault with many environmental education programs, however, lies in a refusal to recognize the learning potential in a variety of environment types; programs focus on natural areas and ignore cities and towns where seventy percent of the United States' population live. To understand the world around them, students need to study rural, urban, and natural environments.

Natural environments display characteristics which are rapidly vanishing: species diversity and habitat without man. City children often see nature only in city parks, and instructors teach ecology as a concept which occurs only in natural areas. Nevertheless the principles of ecology also apply to city environments although, as in nature, variations occur. Valuable learning experiences exist in urban settings although the word "urban" evokes images of hot city sidewalks, harsh wind tunnels, and long streams of traffic. Included within the urban environments are residential, commercial, and industrial areas. Each areas is unique as its distinct name implies. Whereas natural areas provide places to study resources, urban environments show our resource use. Ecology teaches cycling of energy through the food chain. Studying the total environment teaches man's cycling of resources.

Urban areas, especially in rural towns, are close to the school site because schools are usually situated as near to the school district center as possible. The size of Yorktown allows students to walk to and from one end of town during one class period. Walking negates transportation costs and scheduling problems. Estimating an average walking distance of one quarter mile for every five minutes, time circles of five, ten, and fifteen minutes radiate out from the school site (See Figure 30). Fifteen minutes was chosen as a maximum distance a class could travel one way during a one hour class period and still have time for environmental studies. Land use categories

-17-
Figure 29
were patterned after environments in Forman and Godron's Landscape Ecology (1986) and were modified to reflect the distinct differences in use that detailed observation produces.

Natural areas appear to contain minimum human structures or are places humans use for nature contact. Most natural areas are forests or open fields. They include vacant lots, undeveloped flood plains, mowed fields, river corridors, recreation areas, and cemeteries. The most common educational use of natural areas is nature study via animals and their habitats and plant identification. When used for environmental education, natural areas are used as contrasts to urban areas, such as plants versus concrete and asphalt. Simultaneously, natural areas could be used to show similarities to urban areas for nature provides as harsh of an environment as man does, and plants and animals struggle to survive in both places. The survivors and thrivors are called weeds and pests and should be commended for their resilience rather than condemned for it. Children would benefit from learning how survivors use what is available and do not depend solely on one food source or habitat. Resilience depends on variety. Rather than a nature walk, children should embark on an observation walk (See Figure 31).

Managed environments show man clearly evident on the land usually through mono-culture cultivated crops. Farmsteads are also included as well as rural homes and woodlots. Typical educational uses of agricultural areas include farmer interviews about planting and harvesting and Soil Conservation Service personnel interviews about soil and water management. Managed environments are often mistaken as natural areas because people associate crops (new green growth) with nature so they feel man does not impact these areas. With the advent of agribusiness, environmental educators should teach children about agricultural impacts, technological improvements, the wondrous grid overlay, and the hazards of mono-cultures. Students could observe soil changes, fence row habitats, and land form and function.

"The modern suburb is a place which is neither one thing nor the other, which had neither the advantages of the town nor the open freedom of the country, but manages to combine in a nice equality of proportion the disadvantages of both." (The Architect, 1876, Vol. XVI, p. 33)

Suburban areas usually lack the individual touch characteristic of urban residential and, therefore, feel unfriendly. The suburbs are not studied in formal education because children live there and know all about their homes. As an environment, at a glance they seem to offer only a box and a green carpet. In detail, suburbs offer the traditional fight for a mono-culture lawn, non-native species that require pesticides and herbicides, microclimate changes, and social interaction and overcrowding lessons (See Figure 32).

Urban residential lots tend to be much smaller than suburban lots, yet they do not feel crowded; they feel cozy because of minimum set backs, tree lined streets with grass strips between street and sidewalk, and individualization through house style, landscape plans, and personal items left outdoors. Attention to detail creates these human environments that again are rarely formally studied because the children reside there. City dwellers tend to capitalize on property assets rather then create new assets because of limited space. Insects thrive here and winter studies of ice and snow forms can prove exciting and entertaining. Both suburban and urban residences can be compared to animal and plant habitats for similarities and differences (See Figure 33).
Institutional grounds prove interesting because they normally contain several different environment types including natural, managed, and disturbed besides the urban building and asphalt areas. Lessons learned elsewhere can usually be learned here if the educator knows how to relate the concept to the environment at this smaller scale.

Commercial spots including offices, restaurants, and services can be used for more than career planning. These places use plastic and paper in abundance. Where does it come from and where does it go? Heavy use of water and other utilities also occurs in commercial areas. Health issues by way of food groups can relate agriculture to commercial environments. Asphalt runoff can be traced from a source to a disappearance point (See Figures 32635).

Industrial areas require close supervision of children and are usually limited to tours of an assembly plant or loading dock. Comparison of interior and exterior environments prompt contemplation of workspace conditions, and natural resource studies on product, building, and transportation materials can produce astounding mathematical problems. Microclimates are in abundance especially on sunny days. Many industries have a chalkboard or conference room useful for teaching a class.

Disturbed areas reflect a damaged environment that has not been repaired or covered up in some way. Abandoned gravel pits show how man uses a resource and then moves on. Soil cores might produce remnant resources; wildlife abounds in these areas; and plant stresses are clearly seen. Construction and demolition sites as well as garbage dumps and sanitary landfills are also considered disturbed sites.

Surprisingly, within the five minute time circle, seven of the eight environments can be found. Managed land could be found within a six or seven minute walking time. Permission to use a site other than visually would be necessary for all non-public land. Most private landholders would grant this permission if reassurance of no damage was given. Industrial and disturbed land owners might be less willing because of safety hazards which increase when dealing with children. Crossing guards can be used for road crossings, but travel along busy streets or highways without sidewalks is not recommended.