Nature Study

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Only One Earth To Study

The American Nature Study Society

EDITORIAL

There is little doubt that, given a state's natural resources and technological know-how, we could shape our physical environment into the epitome of beauty and harmony. The problem is not in the realm of resources or know-how; it is in the spirit and minds of our citizens.

We as a nation, have not been willing to commit ourselves honestly to the acceptance of the criterion of nature's laws. Yet to healthfully survive, our civilization demands that we operate within the understood rules of ecology and conservation.

The greatest problem we are faced with is that beauty must be real to the mind and spirit before it can exist on the land. We must face the failure of our public elementary and secondary schools to develop this aspect of good citizenship. Materialism has been the basic lesson plan for learning to live.

We suffer like no other nation from pollution of our natural environment and the erosion of man's spirit. We may enjoy the best of health, but mentally and spiritually we are victims of an eroded spirit and a desecrated land. Consider the statistics on consumption of barbiturates, tranquilizers, tobacco, alcohol and narcotics. Consider the mounting cases of heart disease, ulcers, cancer and mental illness.

Man in America has played hookey from the school of the out-of-doors too long. Ever since formal learning became mandatory, we have increasingly lost direct sensory contact with the school that is nature.

In most cases the stepping-stones across this river of neglect have been inundated. Man cannot return to the proving ground where he was fashioned and lived successfully for a million years. Our society will not permit it.

Our fellow teachers would be the first to admit that most of us live in a sterile world of ignorance of our environment. More and more we deal with the things and trappings of teaching: bells, books, models, graphs. We operate in climate-controlled cubicles with hordes of students. We know very little at first hand of community planning, of ecosystems, radiation, pollution, urban renewal, aesthetic appreciation, or the results of 2,000 children in a school flushing toilets twice a day or of 200,000,000 persons throughout America doing the same thing. This ignorance is not bliss! We are poorly qualified to nurture and fashion the intellectual free inquiry of youth into their daily outdoor environment.

Perhaps "seeking relevance" in education by disturbed youth needs to be evaluated. It must be realized that seeking relevance is more than a cliche.

S. B. M.

Some Suggestions For Recycling Solid Wastes*

JULIUS KAIKOW

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The problem of solid waste disposal is one problem which our "conservationists" apparently have failed to recognize. This is one of our most immediate problems; it has a strong bearing on the well-being of our environment. Yet its solution is being left to pragmatists to whom the term conservation is a dirty word, for it may imply the need to spend more tax money, or worse yet, it may possibly call for greater private expenditure to correct an abuse for which the general public may suffer. From the short-term point of view it may possibly be true that properly treating solid wastes will be somewhat more costly, but it is not necessarily so. The important matter is that the problem should be treated not in terms of money, but in terms of long-term benefits to all. Such considerations must transcend immediate costs and be reckoned in terms of returns over a long period of time. Considered in this light, the cost of the benefits will be cheap indeed.

By solid waste we mean such things as garbage, industrial waste and refuse, and demolition debris. Even sewage sludge should be included in this category. Disposal of solid wastes has become a serious problem; in fact a very rapidly-growing problem. This is a problem arising out of rapid population expansion. There is a direct relationship between population growth and waste-disposal problems of all kinds. It is a relationship which necessarily applies heavy pressure on the environment, resulting in changes in ecological balance which are detrimental both to the land and its flora and fauna (humans included). On the one hand, we have the need for providing sustenance for this burgeoning population. In many parts of the world the land is being pressed hard to feed its inhabitants even poorly. The more people, the more space they occupy. This results in the continuous withdrawal of productive land to make room for human habitat and industrial complexes. On the other hand, the waste which these people produce is becoming increasingly difficult to cope with. Our waste problem involves not only municipal refuse and sewage sludge, but also industrial wastes, and even, believe it or not, farm manure disposal increasingly often. In a growing number of instances the problem has become alarmingly urgent because older methods of disposal may no longer be either adequate, safe, or even possible; or it may be a combination of these objections.

Commonly such wastes are disposed of through dumping, sanitary land filling, or incineration. There are a few minor means of disposition, and a few new suggestions have recently been made, but we need not concern ourselves with them at this time. Currently they just do not count, except for the one I am going to discuss shortly. With the expansion of urban areas and their satellites, the suburbs, land for dumping is becoming increasingly unavailable as present sites are filled in. As urban areas have expanded, land for dumping purposes has become unavailable within reasonable hauling distance from the communities, or the practice has been prohibited by zoning ordinances because of the nuisances associated. To a large extent, the same can be said for land-fill operations. Too often, to the dismay of conservationists, town officials decide that nearby bogs or wetlands can be used for waste disposal, often destroying the unique flora and fauna associated with such sites.

In this country the leading disposal method is dumping. That is because it constitutes the cheapest way of getting rid of refuse where land is still available at reasonable costs for such purposes. Needless to say, dumping results in the development of an eyesore. More important, it constitutes a health hazard, for it attracts flies, rats, and other vermin. Also, it may lead to ground water pollution and air pollution; the latter owing to the stench of decomposing organic matter, and also because spontaneous combustion commonly occurs at such sites. Sometimes burning is deliberate in order to reduce volume of debris and prolong the life of the dump. The smoke that arises from such fires rolls over the surrounding countryside and becomes not only a nuisance, but can be very serious for people suffering from respiratory difficulties. That dumping operation adversely affects property values in the immediate vicinity goes without saying.

Landfills Have Future Use

Sanitary land filling operations are less objectionable. Properly carried out, trenches are dug in the ground, the refuse deposited in them, and the earth is then bulldozed back in place over the debris. Flies get no chance to breed. Rodents may still be present to some extent, burrowing into the fill beneath the earth. Commonly ground water may still be contaminated by the buried, decomposing organic matter. When land-fill operations are completed, such lands are excellent for park or recreational purposes, but they should *not* be used for the erection of heavy structures, because they may not have sufficient bearing strength to support such structures, especially if the buried fill contains a high percentage of decomposable organic matter. Only where the fill is composed largely of excavation debris or building demolition debris can such sites serve effectively as safe places to erect heavy buildings without first using extensive piling. In fact, where the fill was largely garbage, single-family homes have been known to sink or collapse within a few years, when constructed on such sites.

High temperature incineration, of course, is fairly desirable from the view of air pollution abatement and reduced volume of ash. But most incinerators in operation today are either antequated or inefficient and yield much smoke high in particulate content. Under some atmospheric conditions incinerators make strong contributions to smog development. And there is still the problem of ash disposal. Efficient incinerator equipment is not cheap and requires some form of fuel at least to start the operation going. It has been suggested that burning garbage could be used for the generation of electricity. It is being done to a limited extent in a few cities in Europe. In this country it is not economically feasible, so far.

The reader will note that so far the discussion has centered about *disposal*. In other words, let's get rid of the stuff; destroy it. As a conservationist, this attitude disturbs me no end. Rather, our discussion should be centering around the problem of *utilization of waste*. Many items in refuse have re-use or salvage value for recycling. Believe it or not, garbage should be regarded as a resource. It has social utility. It is a commodity of potential value. It has at-

* This article is based on a paper entitled "Opportunities in Solid Waste," read at the 14th Annual Conference of the Conservation Education Assn., Springfield, Mo., August 1967.

tributes which are essential to the land that feeds us. Conservation teachers should be aware of these potentialities.

With the growing population, more food must be produced. There is thus a continuous removal of nutrients from the soil. In many parts of the world the soil is gradually losing much of its fertility. While commercial fertilizers may replace the major nutrient elements, the trace elements are not normally replaced, and the organic matter so vital to soil health virtually never. Yet organic matter, or humus, is essential to proper soil structure and tilth. It is time that we recognized the fact that there is a reciprocal relationship between the land and the people it feeds. What is taken out of the soil must be returned if we expect the soil to be continually productive. Destruction of garbage destroys this relationship or balance.

Composting Offers a Solution

Now what is the best way of getting this organic matter back to the soil? The answer lies in the process of composting our wastes. Composting involves the breakdown of organic matter through microbial fermentation during which the temperature of the refuse rises high enough for harmful pathogens and weed seeds to be destroyed, if present. The end product is a dark brown to black humusy material which is a splendid soil conditioner and fertilizer. Scientifically made compost is in every way equivalent to good barnyard manure.

Soils must be maintained at their maximum peak of efficiency in order to be at their prime of productivity. Commercial crops may remove much of the soil's fertility as well as alter its physical character. Chemical fertilizer alone cannot restore this loss. Unless the organic content of the soil is maintained, the soil will suffer physically. A loss of permeability follows, especially where clay is an important constituent. On the other hand, very sandy soils may become more xeric (droughty), since it then permits the rainwater to drain away too rapidly. Humus is thus the important factor in maintaining the satisfactory workability of these soils. Where structure has been destroyed, soils puddle easily and are thus readily subject to erosion. Moreover, humus improves the water-holding as well as the fertility holding capacity of the soils. It is instrumental in helping soils to resist the effects of leaching. Compost can help convert heavy, impermeable soils into workable, drainable, and productive soils. Likewise, it can help porous, sandy soil to hold on to its moisture and be less droughty. Humus is especially beneficial in maintaining a high population of soil biota, which are essential to the proper functioning of the soil as a dynamic body. Furthermore, it has been reported that adequate use of compost reduces the amount of insect damage on crops by keeping crops well fed with a proper balance of nutrients. Insects tend to seek out the less healthy plants.

Thus, by converting our organic waste to compost, we are serving two major objectives: 1) utilizing city and industrial wastes beneficially according to the best conservation principles, and 2) helping to restore or even to improve our crop lands in order to provide for maximum productivity. The Dutch, more than any other people, have proven this can be done at a cost no greater than that of incineration. Much of their reclaimed polder lands have been made arable only through the application of compost to these drained sea beds.

Compost can be manufactured in such a manner that no nuisances arise out of the operation. There are many patented processes. One, for instance, utilizes a large horizontal, rotating drum or silo which resembles a cement-making kiln. Into this drum raw refuse is fed at one end and the finished product removed at the other. In other types of plants, stationary vats of large diameter are filled with refuse and a predetermined amount of moisture added. Then stirring paddles proceed to keep the contents mixed and agitated. Air and additional moisture are added as necessary to keep the fermentation going and to avoid the build up of objectionable odors. Constant chemical and bacteriological checks are kept as in any chemical-engineering procedure. In still another process, we have structures up to five stories high. Garbage is fed into bins in the uppermost level. It is inoculated, kept moist and air forced in as needed to keep the mixture agitated and aerated. Every day or so the top bin is emptied into the one on the floor below, and so on. After one day in the bottom-most bin, it is compost. These are largely continuous processes. It is possible to complete the fermentation in five to seven days. It is then desirable to set the finished product aside for several weeks to give it a chance to cool off and to ripen or mellow before being put to use. It should be pointed out that compost has, or should have, market value for the producers.

Of course, where space is available, it is possible to utilize the out-of-doors as the composting area. The refuse is ground, piled up in windrows, and allowed to ferment in the open. In order to make sure that there is uniform breakdown and to avoid the possibility of pathogens not being destroyed, the piles have to be turned every so often in order that every bit of the pile is subjected to a sufficiently high temperature for a sufficient duration of time to destroy unwanted organisms. This form of compost making is slower, but is much cheaper, as relatively little equipment is required compared to the all mechanical processes which call for costly installations (which may compare in costs with incinerators). Surprisingly, if the raw material is ground up before windrow composting, there is little odor, few flies are attracted, and there is even very little rodent problem. But the enclosed mechanical processes can be operated in the heart of heavily populated areas without creating objectionable nuisances, whereas windrow-composting would not be feasible under such conditions.

Composted Material Is Valuable

The question now arises why compost is not more widely used in this country. It is a very pertinent question. Prejudice undoubtedly enters the picture. Primarily, however, it is because we need to educate the consuming public to the merits of compost. The chemical industry has literally brainwashed our agronomists to the point where they can see nothing else but chemical fertilizers. Those courageous enough to question this point of view have sometimes found it difficult to keep their jobs. The practical Dutch have shown how wrong our agronomists can be. They had to undertake an educational campaign to sell the need for compost. As a consequence they now cannot produce enough to satisfy the demand. Prior to that, they undertook a research program which demonstrated the value of compost. They noted that in order to maintain yields, where only chemical fertilizers were used, each year an increasing amount of these fertilizers had to be applied. What was more, they demonstrated that in the process, soil lost its tilth and structure, and started to erode easily. An application of compost with reduced amounts of fertilizers corrected the problem. Incidently, virtually all fertilizer manufacturers have entered the organic field. After fighting a losing battle to discredit organic fertilizers, they decided to get into the act. If you can't lick 'em, join 'em.

Composting does not, of course, completely eliminate disposal problems. We have non-compostible materials in waste, often a high percentage of it. These include metals, glass, plastics, heavy wooden items, etc. These are items which are best disposed of through such means as sanitary fill. As already pointed out, much non-compostible material has salvage value. Metals, glass, paper, even rags and the like can be re-used and have market values. It is true that

these values are often quite minimal, and perhaps subsidies are required to make their re-use more attractive to industry. If so, it would be highly desirable from the viewpoint of conservation.

It is time that conservationists began to think more fully of the practical aspects of conservation. Too often conservation education boils down to being nothing more than an exercise in nature study. It should be more than that. Let's make it part of the man-land-resource relationship which is meaningful. The gist of the discussion in this paper is in line with this relationship.

The Great Lakes, and particularly Lake Erie have become cesspools from the sewage and byproducts of industries. Other lakes are likewise in trouble, and Lake Champlain on the border of New York and Vermont is one of these. Paper mills and communities such as Ticonderoga dump their destructive effluents into this lake.

Aroused citizens have formed the Lake Champlain Committee which publishes a NEWSLETTER and alerts its rapidly growing membership to some of its problems of which there are many facets. One interesting development to minimize adding nutrients to the lake which increases bacterial and algal bloom is to require marine holding tanks for boaters. In March of 1969 this became mandatory for New York residents along Lake Champlain and will be required in 1970 for Vermont residents. This should be a requirement for all recreational waters and for water short camps in the dry southwest.

Eastern members of ANSS who might wish to learn more about the Lake Champlain problem should contact Blake Lawrence, Charlotte, Vermont 05445.

Homes which rely upon septic tanks should look into the possibility of using marine toilets to reduce the problem of waste disposal.

For every nation, for every state, community or land pattern type there has been developed a cultural system in which its traits and its mores, and its institutions, were interrelated and these tied to the manner of life of the people and the nature of their activities. The escape of vast thousands from a rural environment to our large cities was an escape into a cultural vacuum – a kind of life with no base to give meaning to that life. There is a lack of wholeness which would satisfy even in part the basic biological or the sociological and psychological needs.

Promotion of Natural Sciences in Vermont 1869-1874

RALPH W. DEXTER
Kent State University, Kent, Ohio
Historian, American Nature Study Society

One of the earliest efforts for the promotion of the natural sciences in Vermont was stimulated by three physicians between 1869-1874. They organized a scientific society and founded a scientific journal. Their efforts began with a notice in *The Newport Express* (Vermont) on 7 September 1869 which read, "A special meeting of the Orleans County Natural and Civil Historical Society will take place at the New Academy Hall, in Derby, September 13 at 2:00 p.m. All interested in the objects of this Society are invited to be present." Ten people answered the call. The Rev. S. R. Hall acted as president and Dr. John M. Currier was elected secretary pro tempore. A committee was chosen to prepare a new constitution. Following this meeting another notice was placed in *The Newport Express* that "All persons of Orleans County who are interested in the progress of the natural sciences are requested to meet at the Academy Hall in Derby, on Tuesday, September 28, 1869, at 2:00 p.m. for the purpose of organizing such a Society." At that meeting Dr. Lemuel Richmond was elected chairman and Dr. Currier was continued as secretary pro tempore. The group adopted the constitution and by-laws which had been proposed, and elected offices including Dr. George A. Hinman as president and Dr. Currier as secretary. The Rev. S. R. Hall, who had aided in the organization of this new group and who had served on the state geological survey, was elected as an honorary member. The Orleans County Society of Natural Sciences was incorporated by an act of the General Assembly in the State of Vermont for "The advancement of science and the establishment in said county of a museum and library for the illustration and study of its various branches." This was approved 10 November 1869 by 30 charter members.

The constitution and by-laws had been patterned largely after those of the Portland (Maine) Society of Natural History. Provision was made for the usual offices, a librarian, and as many curators as needed. Ten standing committees were established for the following sciences: Comparative Anatomy and General Zoology, Mammalogy, Ornithology, Herpetology and Ichthyology, Invertebrate Zoology, Entomology, Botany, Paleontology, Geology and Mineralogy, and Ethnology. The chairman for each committee served as curator for the respective sciences. There were also standing committees for the library and for publications.

The Society founded a journal entitled *Archives of Science* which included the "Transactions of the Orleans County Society of Natural Sciences." This was published by Dr. John M. Currier, with Dr. Currier and Dr. George A. Hinman serving as editors. Issue number one appeared in October, 1870, and included papers "On the Character and Customs of the Pawnees" by the Rev. T. E. Ranney; "Indian History of Northern Vermont" by W. W. Grout; and the "Qualitative Analysis of the Mineral Springs of Essex County, Vermont," by Dr. Hiram A. Cutting. There was also a meteorological register based on records recorded by Dr. Currier at Newport for the Smithsonian Institution. Notes, editorials, and book reviews were included as well as the transactions of the Society.

The second issue (January, 1871) included such articles as "Notes on the Flora of Vermont" by George H. Perkins, of the University of Vermont, and "Geology and Mineralogy of Orleans County" by the Rev. S. R. Hall. This issue announced that Dr. Hiram A. Cutting, an active member of the Society, had been selected as State Geologist and Curator of the State Cabinet of Natural History. He also became an associate editor for the *Archives of Science*.

The third issue carried an article on the birds of Vermont by the Rev. Daniel Goodhue. Issues number 8 and 9 (combined) completed Volume I and terminated the publication in July, 1874. A lack of financial support for the *Archives of Science*, dwindling interest in the Orleans County Society of Natural Sciences, and Dr. Currier's new interest in founding the *Vermont Medical Journal* ended these projects on the natural sciences in 1874.

There is no single human problem, such as population control, eugenics, war and peace, or the elimination of poverty, which should monopolize our attention. Any one of these aims, sought by itself without an overall sense of values, may increase our difficulties. — Arthur E. Morgan

World's Carrying Capacity Limited

In a speech to the UN in 1965, Pope Paul said, "You must strive to multiply bread so that it suffices for the tables of mankind, and not, rather, favor an artificial control of birth, which would be irrational, in order to diminish the number of guests at the banquet of life." To this Dr. Ehrlich adds, "The 'banquet of life' is, for at least one half of humanity a breadline or worse."

However, modern sociologists have made many suggestions of ways to increase the world's food supply. These include farming the great portions of the earth's surface that is uncultivated, obtaining a greater amount of food from the sea, desalting ocean water to get more water, the manufacture of food novelties such as protein produced by microbes cultured on petroleum, making high protein food concentrates from cereals, and producing new high-yield varieties of grains.

We cannot expect to increase the world's food production by cultivating more land. If land is not farmed today, it is left fallow for good reasons, such as depleted soil, lack of water, an unsuitable climate, or some combination of these. For example, the flat, empty country in Nevada is too far away from water to make it commercially feasible to farm there. In addition, all flat land isn't farmable, as demonstrated by Khrushchev's 1954 program to cultivate parts of the dry plains of Kazakhstan: the plan failed completely.

It has been suggested that commercial desalting of ocean water could provide enough water to cultivate the desert areas of the world. Under the best conditions, using the most optimistic predictions, the world will be able to desalt twenty billion gallons a day in 1984. However, by 1984 the U.S. alone will need six hundred billion gallons a day — or thirty times as much. In addition, it would be commercially impractical to pipe the water to a place such as Nevada, which would mean getting water three to five hundred miles inland and almost a mile up hill.

Attempts to farm the tropics could also lead to disaster. Not only would chopping down jungles lead to a dangerous decrease in the world's supply of oxygen, but would also be useless since soils in most of the tropical areas of the world are extremely poor. Much of this soil is subject to the process of laterization, which is the changing of the soil (when exposed to light and air) into a rock-like substance called laterite. Even that soil which does not so change quickly becomes infertile when exposed to the sun and air.

As for the "unmeasurable riches" of the sea, as a *Saturday Evening Post* writer called them, man has no idea of how to go about tapping them. "Farming" the sea could greatly increase its food yield if man could breed and harvest phytoplankton, which he does not know how to do. Scientists must also be able to convert this marine harvest into something that people will eat.

Man might be able to increase the hunting-herding yield from the sea, but since fish are higher up on the food chain, we could not obtain as much food as we could from phytoplankton. Moreover, to safely harvest more marine animals without endangering the fish population would require research and much international cooperation which doesn't seem to be forthcoming.

Food novelties, such as the protein-rich food produced by culturing microbes on petroleum are only being produced in small experimental amounts. It is not known if people will accept it, or if it could be provided to people in non-petroleum producing countries unless their economies were such that they could buy it. In addition, this is not a long range cure for the famine problem since the world's petroleum supply is finite.

The production of grains with higher-quality proteins, and the introduction of such highly nutritious food concentrates as Incaparina (a mixture of corn, cottonseed oil and vitamins A and B), CMS formula (Corn, soya, and milk), and

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A.N.S.S. ANNUAL MEETING DEC. 26 - 30

NATURE STUDY AND CONSERVATION EDUCATION FOR ECOLOGICAL EMPATHY

Arranged by JOHN I. GREEN

(Associate Professor of Biology, St. Lawrence University, Canton, New York)

SATURDAY, DECEMBER 26 (Registration only) ..... Conrad Hilton

SUNDAY, DECEMBER 27 ..... Pick Congress, Oxford Room

9:00 a.m. — Chairman: RUTH L. SCOTT (*Co-director, Bioscience Center, Pittsburgh*)

Introduction to the Chicago Environment

WILLIAM J. BEECHER (*Director: Chicago Academy of Sciences, Lincoln Park*)

Man's Impact on Western Streams

STANLEY B. MULAIK (*Professor of Biology, University of Utah*)

Save the Frog

RICHARD J. BALDAUF (*Professor of Icthyology, Texas A & M University*)

7:30 p.m. — Board of Directors Meeting ..... Pick Congress, Victorian Room

MONDAY, DECEMBER 28

9:00 a.m. — Chairman: JOHN I. GREEN

First year Secondary Science Teachers examine their Ecological role; an informal panel. WILLIAM LUNT (*Professor, Department of Biology, Chicago State College*) JOHN GUSTAFSON (*Chairman, Department of Biology, State University of New York at Cortland*)

7:30 p.m. ..... Pick Congress, Victorian Room

Chairman: PAUL V. WEBSTER (*Bryon City Schools, Bryon City, Ohio*)

Lenses on Nature: Collective best from Society members

How to do it: Multi-image program

LOREN S. WOERPEL (*U.S. Forest Service*)

TUESDAY, DECEMBER 29 ..... Pick Congress, Oxford Room

9:00 a.m. — Innovations in Environmental Education

Chairman: DOUGLAS WADE (*Lorado Taft Field Campus, Northern Illinois University, Oregon, Illinois*)

Discussants: PAUL GUNLOCK (*Portage Public School District*)
JAMES ZIMMERMAN (*University of Wisconsin*)

12:00 a.m. — Annual Luncheon and Presidential Address. Field Museum Natural History

Presiding: RUTH SCOTT, (*President, A.N.S.S. — Co-Director, Bioscience Center, Pittsburgh*)

7:30 p.m. — Board of Directors Meeting ..... Pick Congress, Victorian

WEDNESDAY, DECEMBER 30 ..... Pick Congress, Victorian Room

9:00 a.m. — Field Trip (Bus) Morton Arboretum; Horticulture, Conservance of Natural Areas, Nature Study, Research, Lunch.

Chairman: MARION HALL (Moreton Aboretum)

TIPS *for Environmental Education . . .*

TIPS FOR CREEPS

STANLEY B. MULAIK

The *Nature Hike* too often has little nature because there is mostly hike. Lealers of nature hikes too often are well meaning, but with the usual training they receive, they know too little of nature to use for stimulating observation and seeing what is underfoot. Stated bluntly, the leader may have stopped for five things along a trail a mile long because he knew only five things about which to spend some time. He had not learned the techniques of good nature leadership seen demonstrated by Cap'n Bill Vinal, E. Laurence Palmer, Roland Case Ross, Ralph Waldren, and others, to know what to do.

The *Nature Creep*, which may not carry one in an hour's time much over a few hundred yards at the most, might be tried. Rachel Carson had much to say in *The Sense of Wonder*, a wonder which most adults have lost and which is inherent with small children. She says that "A child's world is fresh and new and beautiful, full of wonder and excitement. It is our misfortune that for the most of us that clear-eyed vision, that true instinct for what is beautiful and awe-inspiring, is dimmed and even lost before we reach adulthood. If I had influence with the good fairy who is supposed to preside over the christening of all children, I would ask that her gift to each child in the world would be a sense of wonder so indestructible that it would last throughout life, as an unfailing antidote against the boredom and disenchantments of later years, the sterile preoccupation with things that are artificial, the alienation from the sources of our strength."

The Nature Creep should bring to a focus many of the myriads of little things which make up this intricate world. The items close by to be observed might range from observing the breathing of a grasshopper, to the "brush" on the outer side of the style of many composites which scrape the pollen from the tube formed by the anthers as the style grows up through it.

An aid to opening up a new world of little things is a hand lens. This need not be over ten power. Rachel Carson in her *Sense of Wonder* makes the following observation: "A lens-aided view into a patch of moss reveals a dense tropical jungle, in which insects large as tigers prowl amid strangely formed, luxuriant trees. A bit of pond weed or seaweed put in a glass container and studied under a lens is found populated by hordes of strange beings, whose activities can entertain for hours. Flowers, (especially the composites), the early buds of leaf or flower from any tree, or any small creature reveal unexpected beauty and complexity when, aided by a lens, we can escape the limitations of the human size scale."

At the Conservation Summit of the National Wildlife Federation last July a group on a nature creep found unmistakable differences in the diet of deer, elk and ground squirrels revealed by a study of dry scats. The deer had evidences of chips of twigs which showed woody structure. Deer are browsers. The elk scats showed only traces of grass for they are grazers. The ground squirrels, on the other hand, were omnivors in that in addition to plant material in their scats there were the chitinous remains of insects such as grasshoppers and moths.

The ground cover in this convention area was unique. There had been no cattle or sheep grazing for nearly a half century in the area. The turf was so tough a trowel could scarcely be pushed through it. The mass of roots of grasses, the mosses and lichens which were on or near the surface resisted washing by even heavy rains. Here was literally virgin ground cover such as the early settlers found over most of the west.

A close-up view of the growth on the surface with a hand lens required the group to literally creep. This was largely on knees and elbows. The leaders of the twenty-one groups of "creeps" were very gratified at the arousal of a sense of wonder which in the adults had become dormant and severely atrophied. On this matter we again must quote Rachel Carson who so aptly presents a related view.

The Nature Creep will not rush by most of nature and will permit exploration of the environment to its fullest. Discovery then becomes the theme.

"What is the value of preserving and strengthening this sense of awe and wonder, this recognition of something beyond the boundaries of human existence? Is the exploration of the natural world just a pleasant way to pass the golden hours of childhood or is there something deeper?"

"I am sure there is something much deeper, something lasting and significant. Those who dwell, as scientists or laymen, among the beauties and mysteries of the earth are never alone or weary of life. Whatever the vexations or concerns of their personal lives, their thoughts can find paths that lead to inner con-

tentment and to renewed excitement in living. Those who contemplate the beauty of the earth find reserves of strength that will endure as long as life lasts. There is symbolic as well as actual beauty in the migration of the birds, the ebb and flow of the tides, the folded bud ready for the spring. There is something infinitely healing in the repeated refrains of nature – the assurances that dawn comes after the night, and spring after the winter."

During a nature creep a posture on knees and elbows with a hand lens scanning the mosses on the forest floor may appear undignified, but here is handiwork of nature which without the lens is inconspicuous, yet vital to the whole story which nature can reveal.

Much of our education was from the printed page. Book writers on nature might themselves be good naturalists, yet their writings deal with the gross, the large, the obvious. There is infinitely more to see of beauty in the delicate details of the elements which go into the whole. Even the textbook treatment is an affair of ink on paper with no opportunity for the individual to see even the gross thing as it really is.

MODELS AS VISUAL AIDS

NOTE: Plasticene and putty can make maps and geomorphology meaningful. This was well demonstrated in an in-service course for teachers given at Wave Hill by Sally Kerlin, conducted during a session on mapping as a method of giving children meaningful concepts about land forms and land use. Because her techniques seemed to have universal value, I asked Mrs. Kerlin to write the activities for NATURE STUDY TIPS.

– HELEN ROSS RUSSELL

Making and Using 3D Maps

SALLY KERLIN

Plasticene can be used to help children understand the symbols for relief used in most geography books and atlases. It usually requires much imagination to translate the series of colors – light green to liver color – into mental images of mountains and plains. Using a simple outline map the children can build up mountains of plasticene and, with actual pictures to guide them, can make the surface of an appropriate character, rugged and steep, rounded and worn, with plateaus and valleys that bring many of the relationships between man and the land to light. The effort to be strictly accurate should not interfere with the children's concern with the significant land forms.

Children can also discover the meaning of contour lines or the boundaries of the color relief areas by building a sample mountain in a tin tray. The mountain should have steep slopes on one side and gradual slopes on another. Then the children can add water to flood the lower part of the slope and mark the water line on the plasticene. By successively adding the same amount of water and marking the water line each time, they will then, when the water is poured off, have a real understanding of what the height boundaries on a flat map mean.

To make a relief map of an area that the children have studied on the ground, plasticene can be used with the government topographic sheets as a base map. These always have contour lines to indicate the height of land. If the geology of the area is not too complicated, the children can use different colored plasticene to represent the different kinds of rock and then would be able to work out the relationship of the shape of the land to the underlying rock structures.

Another useful material for the children to use is ordinary putty, which is easy to mold and reusable if kept in an airtight container. Children can model the important features of the area they are studying, large or small, in a tin tray, developing from their models the resulting uses of the land. Where will the roads and railroads go? Where will people want to live, to farm, to build factories, to ship goods? They can model the undersea contours of harbors and then see what islands and estuaries are by adding water to their trays. It is not the finished product but the thinking that goes into the creation of such models that counts.

Stanley and Dorothea Mulaik and John Gustafson attended the annual convention of the Conservation Education Association held in Lafayette, Louisiana, in August. The program was excellent, and for many, the highlight was the field trip to the Avery Island Wildlife Sanctuary where the early fight to save a habitat for the snowy egret was focused.

ANSS And A Livable Environment

Members of ANSS need to look critically toward their environment. In the introduction to the Annual Report of the Conservation Foundation is the following which bears on the place ANSS and its members must not neglect to maintain to fulfill its aims and objectives:

"In this time of rapid social change, no 'conservation' organization worth its salt can be insulated from the social and civic concerns which surround our lives and pervades our living. The basic validity of the ecological view has become conspicuously relevant to everyone who knows Lake Erie, the SST or smog. Arguments attending urban thruways, waste disposal, parks-for-people, polluted products, slum surroundings and land controls intensively mingle the ecology we have known with social, economic and political factors."

Liberty Hyde Bailey stated that the purpose of nature study was "to put the child in a sympathetic attitude toward nature for the purpose of increasing his joy of living." This is still true today. However, technological development, the mass rush to increase the gross national product, and other aims at the economic aspects has made severe inroads on the natural world. These inroads are in the form of immensely increased air and water pollution, esthetic degradation of the countryside, noise increase everywhere, and destruction of rare natural habitats.

We must not lose sight of the main purpose of nature study. To fulfill these purposes the fight must be intensified to protect the natural environment that there be some left to enjoy. This can take the path of fighting against the industries which pollute and destroy the natural base of our world and against chemical industries which have greatly augmented the chemicals in our streams, in our foods and in our air.

Ted Pettit recently commented that dandelions collected along a freeway turned out to be heavily loaded with lead residues from automobile exhausts.

Half a century ago sunsets could be enjoyed for their brilliance. Today many communities have difficulty seeing a good sunset because of the heavy smog which obliterates the sky and leaves the sun a sullen glowing mass if visible at all.

The quality of the environment cannot be separated from the quality of the human life to be lived in it. There can be little increase in the "joy of living" in an environment turned synthetic with asphalt, city and suburban jungles, and

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The Nashua River Clean-up

MARY L. HARREISEN

How do you clean up a river? How do you get elected officials to act? How do you get high standards set for a river? How do you get a river selected as the model river for clean up? The answer to these questions is easy: it takes people, persistent people, making their wishes known to their elected representatives, over a long period of time. And that's the end of easy answers. Keeping people stirred up over a period of years is not easy. It requires leaders who are obsessed with their cause, leaders who think of little else than how to keep people nipping at the heels of their legislators. But that's a separate story, written between the lines of this one. One big story is one of large-scale citizen action geared to tackle a big problem and to achieve a truly significant goal.

In June, 1966 in the middle of a prolonged drought, the Nashua River reached a septic condition throughout much of its watershed in both Massachusetts and New Hampshire and it would not support life. Its stench was detectable for a distance of several miles. The sight of it, greenish-brown and putrid, and laden with chemical and paper wastes and bits of domestic sewage, assailed the eyes. For those people who had lived near the river longer than forty years, the sight and smell assailed the heart as well. They could remember bygone days when swimming, boating and game fishing in the Nashua River were synonymous with summer. At this time the Conservation Commission in Hollis, N. H., under its chairman, Mr. Wayne Kimmerlin, presented a 600 signature petition to Governor King protesting the condition of the river and supporting interstate cooperation in correcting it. Mrs. Hugh Stoddart of Groton, Mass. decided that a petition drive in that state would be effective too, and launched a campaign to collect signatures. The end result was a petition, signed by more than 6,000 citizens living in the Nashua River watershed, which was presented to the governors of Massachusetts and New Hampshire. It noted "the stinking, filthy, putrid condition of the Nashua River," and said, "we request that you use all of the powers and influence vested in you and your office to immediately enforce the laws of Commonwealth pertaining to water pollution, and take all further steps to correct this absolutely intolerable situation." This was the first public out-cry about conditions along the Nashua River; the first time that the citizen's disenchantment with this sewer that flowed in their midst was effectively channeled so that it came to the attention of officials in a position to alleviate the condition. That was four years ago. The pressure has never let up.

Later that fall Interior Secretary Stewart Udall and Senator Edward M. Kennedy took a quick flying trip over Massachusetts' most severely polluted rivers. Because of the sudden upsurge of interest in the Nashua River, they arranged to include it in their tour and to address a group of citizens at the Fitchburg Airport. Mrs. Stoddart alerted the Conservation Commissioners and other concerned groups of this opportunity to present their desires for action. As a result, more than five hundred people turned up at the airport. This kind of response has a positive effect on elected officials, and Senator Kennedy has been and continues to be an active proponent of anti-pollution legislation, particularly as it affects the Nashua River. Coincident with this federal viewing of the major polluted rivers in the state was the signing of the nation's first comprehensive water pollution control legislation by the State of Massachusetts. The Nashua River Clean Up Committee, as Mrs. Stoddart called herself and her supporters, felt that the petitions it had presented to Governor Volpe were the catalyst in getting the special legislative committees studying water pollution in Massachusetts to submit legislation to the House and Senate. Because the bills were filed late their admittance to the Senate and House required a 4/5 vote by each branch. This legislation, which many felt had no chance for passage, was enacted almost immediately after the governor had received the petitions.

One of the first tasks to be accomplished by the newly-formed Division of Water Pollution Control was the classification of each river in the state for its future highest use. The present classification of the Nashua River is U, or unsatisfactory for the transportation of sewage. The Department of Public Health, the state agency originally responsible for water classification, had recommended that the river be improved to a D, or suitable for the transportation of sewage. Then the Division of Water Pollution Control went one step farther by recommending the future highest use of the Nashua River as a C or "suitable for recreational boating; as habitat for wildlife and native food and game fishes; for certain industrial processes and cooking; suitable for irrigation of crops used for consumption after cooking. Good aesthetic value." The Federal Department of Interior set June 30, 1967 as the deadline for submission of water quality standards for all inter-state rivers, and Division of Water Pollution Control then scheduled hearings for each of these rivers. This river classification hearing presented the next big challenge to the citizens of the Nashua River Watershed. It was up to them to make known to the Division of Water Pollution Control the uses they wanted for their river. The hearing date was set for March 22, 1967, at the auditorium of Fitchburg State College. The Nashua River Clean Up Committee tackled the task of mobilizing public interest and assuring an impressive turnout at the hearing. All elected officials and representatives of town boards in the towns along the river were asked to present their recommendations; all groups in any way concerned with or affected by the river were asked to testify at the hearing. Letters in local papers explaining the hearing and the need to attend it were written by Mrs. Stoddart, who also has published questionnaires the readers could cut out and mail to her showing their desired river classification rating. These questionnaires were to be presented at the hearing.

On March 22, the residents of the watershed, with the effectiveness of unified action and the example of the strength of numbers fresh in their minds, turned out in force at the hearing. Most of the industries and the city officials of Fitchburg during this period, felt that a D classification was the highest possible use that was economically and technically feasible. But the testimony showed clearly that the preference of the large majority of the citizens of the watershed, and of the elected officials and town boards, was that the Nashua River be improved enough to become classified a B river, clean enough for water-contact sports such as swimming.

(Editor's note: The author of this article, Mary L. Harreisen, is a housewife, ardent canoeist, conservationist, Secretary of the Nashua River Clean Up Committee, Secretary of the Nashua River Watershed Association and Secretary of Nashoba Conservation Trust Inc., Pepperell.)

The end result of the hearing was for the Division of Water Pollution Control to modify its C classification by adding to the main stem of the river a class B bacterial requirement. While a modified C was not the classification the Nashua River Clean Up Committee felt the citizens of the watershed wanted and deserved, it was, nonetheless, an improvement over the initially recommended straight C classification. It was further proof, if such was needed, that people can "buck the City Hall;" that elected officials will listen if they hear enough voices.

In the past year several developments have occurred that are milestones in the job of cleaning up the river. One of the biggest was the completion, for the city of Fitchburg, of an $86,000 engineering study by Camp, Dresser and McKee of industrial waste and domestic sewage pollution with suggestions on what measures the city must take to comply with the modified C classification requirements of the river. Other important achievements were approval by the Fitchburg City Council (unanimously) of a Nashua River pollution abatement loan of $17.5 million; a $663,000 state grant to prepare a final plan for the construction of two large waste-water treatment facilities, and a $163,000 state grant for a pilot demonstration project on the Nashua River. The city of Fitchburg, under the leadership of Mayor William Flynn, is slightly ahead of its state-regulated pollution abatement schedule. Construction of the two treatment plants is expected to begin in 1971.

Raising funds for Fitchburg's two waste water treatment plants touched off another petition campaign last spring. Mayor Flynn was concerned that promised federal funds might not be forthcoming when Fitchburg and the other cities and towns along the river were ready to begin construction of their treatment facilities. In this petition, the Nashua River Clean Up Committee sought assurance from the federal government that it is, in fact, committed to doing its part, by noting the remarkable cooperation that citizens, municipalities and industries have shown in doing their share in cleaning up the river. This petition, with more than 13,000 signatures, was sent to President Nixon, Governor Sargent, Governor Peterson, and to Congressmen and State Legislators from Massachusetts and New Hampshire.

Another milestone of 1969 was the selection of the Nashua River for the Model River Basin Demonstration Project by the New England Regional Commission. Legislation was introduced and authorized by Congress to make the selection of the Nashua River for this project a reality by providing about fifteen million dollars to the New England Regional Commission for use in improving the Nashua River.

What all this really means is that the dedication of those involved in the Nashua River project locally have qualified it to serve as a model of how to clean up a river, and that the entire project may someday be held up as a shining example of what concerned citizens can do.

As this story goes to press, I am happy to report that Mrs. Stoddart has received word from the office of Secretary Maurice Stans, of the U. S. Department of Commerce, that funds have been included in the New England Regional Commission's fiscal year of 1971 budget requests for the Model River Basin Demonstration Project. The Nashua River Clean Up Committee now has only one more federal hurdle to overcome; to get U. S. Congress to appropriate these authorized funds.

The last major development in 1969 was the birth of the Nashua River Watershed Association, which officially represents all people interested in cleaning up the Nashua River. Since its incorporation on October 16, 1969, the directors have been formulating ideas about how to make the new association effective. The NRWA's purposes, as stated in the organization's By-Laws, are: "to work for the restoration and maintenance of clean water and related natural resources in the Nashua River Watershed" and "to acquire land or land rights for conservation purposes . . ."

The accomplishments of the first purpose is well under way. Every polluter of the river is complying with the pollution abatement schedule set by the Massachusetts Division of Water Pollution Control and the Department of the Interior. The city of Fitchburg, largest polluter on the river, is leading the way in meeting abatement schedule.

The NRWA now wants to mount a frontal attack on the second area of concern: the conservation of the land along the banks of the river and the subsequent establishment of a greenbelt from central Massachusetts to the confluence of the Nashua and Merrimack Rivers in Nashua, New Hampshire. The time to achieve this goal is frighteningly short because as soon as people begin to believe that this old familiar sewer is really going to be transformed into a river suitable for boating, hiking, fishing and other quiet and pleasant uses, the presently depressed land prices will sky-rocket. This change has begun already.

The directors of the Nashua River Watershed Association have been particularly interested in attracting the interest of the Conservation Commissions of the towns along the river and in establishing close working relationships between these Conservation Commissions and the goals of the Association. The NRWA is compiling a master map showing present use of riverbank land in each town along the river from information supplied by the Conservation Commission in each town. All towns agree on the importance of the conservation of river-bank land and have earmarked such land for protection. The importance of this cooperation between the NRWA and towns that lie along the river cannot be over-emphasized. The newly-formed Conservation Committee at Fort Devens is also supplying information, as well as other invaluable assistance. A private conservation organization, the Massachusetts Audubon Society, has given NRWA significant assistance, and NRWA welcomes assistance of other private organizations, such as local and county sportsmen's clubs. Inquiries for membership should be directed to: NRWA, Groton, Massachusetts 01450.

The ultimate objectives of NRWA are to provide clean water in the Nashua River and to conserve a green belt stretching the whole length of the river from central Massachusetts to Nashua, New Hampshire. The achievement of these goals will be of tremendous benefit to each person and business in the watershed. Not only will it make our cities and towns more attractive communities in which to live, but it will greatly increase the property values and tax bases.

In the past, industries and conservationists found it rather difficult to join together on common causes. It is a different story today. On the Nashua River industries are now working with conservationists to clean up the river and conserve its banks.

The Nashua River Watershed Association is on the brink of being extraordinarily successful in meeting all of its objectives. And the original Nashua River Clean Up Committee will continue to press for passage of important legislation that bears upon the achievement of NRWA goals. When these goals are met the people of the Nashua River Watershed will not only have saved a river and its banks, but will have provided a model for all other river basins to follow.

(Reprinted from Massachusetts Wildlife)

Stability in Ecological Systems: The Ultimate Challenge*

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An Address at the Dedication of the Biology Building, S.U.N.Y. at Albany, Nov. 22, 1968

It is a special pleasure for me to participate in the dedication of a building to science and especially to biology here in the hills of Albany. I would take the liberty of indulging my botanical background and of advocating a name for the building, the name of a very famous botanist who as a boy roamed the hills of this section of New York. Asa Gray of course needs no building to keep his name before us; any of us will be fortunate indeed to have our works live as long as Asa Gray's contributions to the knowledge of the flora of the Northeast have lived, rejuvenated periodically by new editions of Gray's Manual of Botany, undertaken by the ablest scholars.

It would be fun to chat with the old gent, an office-type botanist, who spent his later life deluged with collections from his correspondents elsewhere, unpopular among many because of his support of the theory of evolution, an active scientist of the 19th century. We, who can look back on the Industrial Revolution's impressive achievements, we who can view history from the very pinnacle of civilization, we who have learned that technology can solve all small problems, would have to confess, if we are honest, that despite our achievements the future is problematic. We would have to confess that we are even now beset by crisis on crisis: we have the bomb, the war, the population, the cities, the ghettoes, the crime, the inflation, the pollution and the supersonic transport. We would have to confess that even our students, callow, idealistic, see the problems and are taking us to task on the issue of the "relevance" of curricula and the intransigence, inertia, and insensitivity of governments to what our students see as the Great Issues. Mr. Gray might say, "Ah yes, my dear fellow, but all ages have had their crises. We had in my time all those pinheads who were against evolution. And we had that terrible war. And do you moderns still read Thusydides? The stupidities that led to the Peloponnesian war were not different from those that led to the wars of my day and yours." "Ah yes," we say doggedly, "but things *are* different now." And that's what I would like to talk about — how things are different now.

They are different because of growth, growth of population, growth of technology, growth of demand, growth of the gross national product, growth to the point where the world is small. Recently Philip Abelson, Editor of Science, in one of his characteristically incisive and brilliant editorials entitled "The Inexorable Exponential" pointed again to the well-known fact that even the apparently low growth rate of 3% per year involves a doubling time of 23 years, leading in not many generations to very large numbers and ultimately, of course, to infinity. He wrote: "Society has been, and still is, on a great growth kick. If we are interested in a long-term future for man, we will regard rapid growth with suspicion. We will look for and point out, the unexpected and unpleasant consequences of exuberance long continued, and seek to moderate it before irreparable damage is done."

In a similar vein recently Robert S. McNamara, now President of the World Bank, made the need for a policy on population the principal point of a major address. Certainly there is growing understanding, perhaps even a consensus emerging, that the ultimate amelioration of the rapidly compounding crises of the 20th century, including its wars, the ghettoes, and possibly even the SST, will depend on establishment of some sort of equilibrium between numbers of people and resources. Continued exponential growth of population leads inevitably to increasing competition, not only for food, but for all resources and must ultimately lead to the degradation of society. *Homo sapiens* will survive some hundreds or even thousands of years longer, but at what level, with what standards of life?

The problem, however, is not simply one of controlling numbers of people in a world of finite resources as is so often assumed. Population must be controlled and we must move with desperate speed to do it; but resources, too, are flexible, some apparently infinite or at least very large, and others clearly limited. We seem to be able to expand the resources of power and transportation almost without limit, but in the process we degrade other resources, some irreversibly. It seems clear that the ability of technology to expand resources exists only within the context of a world in which resources in general are large in proportion to the demands made on them. As demands spiral upward, pushed by growth of population and by a burgeoning, and in some ways malignant, technology there is a similar acceleration in the rate at which new problems with finite and degraded resources appear.

We have limited some of these problems. It is a triumph of science and politics that much of the civilized world has accepted the fact that radioactivity from tests of bombs in the atmosphere is not rendered innocuous by dilution into an apparently limitless biosphere and has agreed by treaty to ban such tests, thus moving at considerable cost to technology, to governments, and even to national prestige and military preparedness toward sustaining a habitable and wholesome world. So there is hope that society, acting even internationally, can bring restraint to bear on other crises of environment, the crises that will prove to be the Greatest Issues of the 20th century — and probably the Greatest Issues ever. There is hope that we can act collectively to protect those elements of the biosphere that are necessary to sustain life as we know it. There can be little question that the stability of those physical, chemical, and biological systems of the earth that sustain the biosphere must be guaranteed. It is a first step for science to identify these systems, measure them, and to recommend their husbandry. The evidence at the moment is that we are very slow in doing this necessary job, having waited until we are well up on many of the "inexorable exponentials," when there is ample evidence that we are changing the CO_2 content of the atmosphere, or eliminating important species with toxic materials or making a dozen other irreversible changes in the world.

It is, strangely enough, necessary to remind even biologists occasionally that the biosphere is a product of the evolution of life, maintained suitable for man and for life as we know it by life itself. All of the energy driving the living systems of the earth is solar energy, fixed at one time or another by green plants. Cheap nuclear power is very unlikely to change this basic pattern, despite its obvious promise for man. The engineer's dream that cheap power can be turned to any earthly (or unearthly) purpose is almost certainly not true.

Evolution, moreover, has apportioned the resources of any site, including solar energy, water, nutrients, and even season, among diverse users that we recog-

*Research carried out at Brookhaven National Laboratory under the auspices of the U.S. Atomic Energy Commission

nize as species, each species having some special role in a larger community consisting of many species. Terrestrial communities are familiar to us all as forest, field, prairie, savannah, steppe; aquatic communities are less familiar but equally real and important to the biosphere. The marine communities seem now to play the major role in maintaining the gas balance of the atmosphere.

It stands to reason and has been abundantly documented that the species of these diverse communities are not just randomly distributed and numerically uncontrolled. The controls of population size are many, complex, often poorly known, and the subject of continuing study. That they exist is conspicuous, for the communities are faithful of pattern and form, predictable of structure. There is a considerable body of evidence suggesting that one of the relationships controlling population size is defined by what I call the 10% law: about 10% of the energy (10-20%) entering any trophic level is available for transfer to the next higher trophic level without introducing serious instability into the system. Thus in natural ecosystems about 10% of the solar energy fixed by plants is available to herbivores; and 10% of the energy entering the herbivores is available to the first level of carnivores; and so on through two, sometimes three, levels of carnivores. Disturbance destroys this structure, eliminating first the more vulnerable, the long-lived, the slow to reproduce. It favors the opportunists, the small plants and herbivores, the short-lived, the prolific, the quick to reproduce – the groups we distinguish when they compete with man as "pests."

Thus evolution progresses to build communities that are stable in the sense that the sizes of populations are regulated within finite limits. But "stability" implies much more than this, for it must be remembered that in the evolution of life time is very large indeed, virtually infinite, and "stability" takes on a new set of dimensions involved in the perpetuation of life over the long, long run. The patterns seem clear enough: evolution tends toward diversity, dividing the resources of any site among an ever-in-organisms, or species, each species having some specific role in the community and using some specific set of resources. The sharing of resources involves "competition" and it is a characteristic of creasing number of different kinds of evolution that competition is reduced to a minimum. Thus natural communities contain species whose roles are specialzied for the particular assemblage of organisms in that commnuity. The species are what we might call "niche differentiated." The question of just what "niche differentiated" means, how resources are apportioned and how to measure this apportionment, has been a particularly nagging one and seems to be without simple solution. Work at Brookhaven National Laboratory has suggested that the ranking of species of plants on the basis of their net primary production follows a geometric sequence in mature, stable communities that consist of niche-differentiated species and departs from this geometric sequence in proportion as exotics appear in the community as a result of disturbance. Thus net primary production appears to integrate neatly the complex of relationships between the species of a natural community and its partitioning among species seems to provide one measure of the degree of integration present.

But the factors, the resources, that are integrated here are themselves only poorly recognized. It is most certainly true for instance that natural ecosystems do not gather the nutrient elements that are necessary for life from the uplands, run them once through an ecosystem and dump them efficiently into the seas as our civilization does. On the contrary, they are accumulated and recycled through diverse and still poorly-known pathways to be used and reused within the system, thereby continuously augmenting the potential of the site and enhancing the evolution of still further diversity. Our own studies have shown for instance that about 16% of the total inventory of cations in the Brookhaven Forest move in short-term cycles of a year or less. As we learn more about the integration of these communities there is no doubt that we will discover that not only are species differentiated with respect to morphology and patterns of behavior, but so are they differentiated in their use of nutrients and in their chemistry.

The point is not that nature is beautiful in aspect and in the details of integration; it is both of these things. The point is that the evolutionary solution to the problem of sustaining life on the planet has involved the development of very complex devices for stabilizing biological systems in the short run and augmenting them in the long run and it is these systems up to now that have built the biosphere.

It is highly probable that these systems played a major role in development of an atmosphere containing 20% oxygen and 0.03% CO_2; it is these systems that determine the nutrient budgets of the biosphere; that make water "clean;" that both directly and indirectly affect the earth's albedo, affecting energy budgets and the hydrologic cycle.

Man's systems stand in stark contrast. In general we are efficient exploiters, mining resources of all kinds and bartering energy to make up deficiencies. Our system works, so far, pretty well and it's not likely to be changed much. But the impact of human activities on the natural ecosystems of the earth are now so great in the aggregate as to raise serious questions as to how much further we can go without seriously upsetting things.

The pattern of change is conspicuous; there are many examples. Perhaps the most familiar is Lake Erie, the victim of eutrophication and pollution. Its diversity, which once supported fisheries, replaced by *Cladaphora*, a filamentous green alga, and by blue-greens, some of which fix nitrogen, further aggravating the problem. The complex structure of the older and stable community has been lost, replaced by a series of blooms of a few species of small, rapidly reproducing plants, which decay rapidly, changing the lake to a soup, stinking of hydrogen sulfide, amines and other products of anaerobic decay. The same pattern can be seen in water bodies, even in estuaries, all over the world. The estuaries on the south shore of Long Island show a similar pattern in varying degrees. Lake Michigan, despite its bloom of Coho Salmon, appears on the verge of the same decay.

Perhaps we can afford the loss of lakes this way, but there is ample evidence that the oceans are being degraded as well and I would suggest that we have no oceans to spare. It is on this basis that I have suggested that pesticides pollution is the world's worst pollution right now, although there are certainly competitors. There is little question now that the persistent pesticides, especially DDT, have accumulated in the biological systems of the earth to the point of eliminating certain bird populations. We have known for many years that populations of carnivorous and scavenging birds the world over have been declining abruptly, some populations disappearing. Difficult as it may seem to link changes in a wild population to a single cause, this decline has been tied beyond any question to the use of the persistent chlorinated hydrocarbon pesticides. Recently it was shown by my colleague at Stony Brook, Dr. Charles Wurster, and David Wingate, that populations of the Bermuda petrel, a scavenger and carnivore of the open ocean, a bird that never comes into direct contact with sprayed areas, also contain DDT residues in concentrations similar to those in other declining avian populations. Thus the food chains

of the North Atlantic are contaminated to the point of having biological effects. So are the food chains of the Pacific and probably those of the rest of the world.

These changes in bird populations are small signs, conspicuous ones, known because we watch birds closely. But a careful student would speculate that there are changes at every trophic level. We have recently shown that the absence of fiddler crabs from marshes on Long Island is due to concentraton of DDT in the organic detritus in excess of a few parts per million. And it is easy to make a case for declines in oceanic and coastal fisheries due to accumulation of pesticides.

You might say: all right, one or two species is small cost for the benefits of pest control. Nature will come again to equilibrium and things will be much as they were before. I doubt if many of us would miss the Bermuda petrel or have missed the peregrine falcon, which not many years ago nested all over the Northeast. But it's not quite as simple as that. With a half-life in the environment estimated in excess of 10 years and an average annual input of the order of 200 million lbs., residues of DDT will continue to accumulate for another 50 years or so, ultimately reaching an equilibrium concentration with about 3 billion lbs. circulating in biological systems. We are less than half-way up this accumulation curve. And DDT is only one pesticide, and the pesticides only one class of toxic substances currently being released. And 10 ppb of DDT in water has been shown experimentally to reduce photosynthesis of marine phytoplankton, the basis of oceanic food chains, by 50%. Surely there is a more reasonable approach.

It seems clear that we are at the moment degrading the natural ecosystems of the earth in diverse, unknown, uncontrolled, unguided, unrestrained and totally unscientific ways. It is one of the great contradictions of our time that in the age of science when technology can put three men in orbit around the earth and study them on television we can't say what the significance of the removal of one species, or even 10 species, from one of the life-support systems of the biosphere may be. And yet we are removing these species, without even sufficient thought to hope that we won't miss them later on. How far will we go with this type of Russian roulette?

We do have some experience with an analogous problem, limited, practical. but real and a model. I would propose the the Bomb and the problems that it generated with ionizing radiation are worth a moment's thought. Many of you will recall the 1954 tests at Bikini which dropped fallout at levels lethal for man over several thousand square miles of the Pacific, contaminated tuna and raised widespread concern over whether the people of the rest of the world were receiving significant exposures. That set of tests and the public outcry that followed it set off a decade of research on radioactivity, its patterns of movement around the earth, its pathways through biological systems and its effects. Some of you know the contributions that radiobiological studies, stimulated by the need to know about radiation, have made to our wisdom in handling radiation and to our understanding of biology. Much of what we know now about what I would call the comparative physiology of ecosystems has come from the large research programs developed in response to this need to know about radiation. On the basis of the knowledge gained from these researches, both in the U. S. and elsewhere, we have developed an administrative scheme for handling radiation without degrading the world. The scheme has where it can, a firm basis in science, and has generally recognized the need for conservatism where it can't be based on science. We have been successful to an astonishing degree even on an international scale. Although we are far from being above criticism in our handling of atomic energy, the fact is that we have limited the problem scientifically and politically in what I would consider exemplary fashion.

We will use the earth, all of it and all of its diverse resources. We may learn to recycle these resources, at least some of them. But how many resources can we use and at what rates? How many species can we eliminate before we have made a fatal, or perhaps only a costly, error? How many cycles of nutrients can we interrupt before we trigger an irreversible change in the biosphere? How can we exploit without destroying the ecosystems of the earth?

We have allowed ourselves to be preoccupied with the immediate, the acute challenges of war, of disease, of famine, of urban problems, of science, of technology, of pollution — all of which are important. But the ultimate challenge, the response to which will determine the level of life of our children now living, lies in the confrontation between man and the biosphere. The challenge is to Science for a continuing redefinition of the problems; and to Society to recognize the urgency and to react sensitively but with the wisdom and restraint needed to guarantee the stability of the biosphere.

And so, Mr. Gray, the world *is* different now. We have expanded beyond that virtually limitless frontier of 100 years ago; we have grown in numbers to fill the world and more; but worse, we are continuing to grow both in numbers and in our ability to degrade the life-supporting systems of the whole earth. To avoid sure catastrophe we must shift our objectives from "growth" with all of its exciting and for us customary ramifications to "stability" with an equally profound but less attractive set of ramifications. And where better to start the new science treating stability in ecological systems than in a new Biology Building on the new campus of this spectacular and promising new university?

Kidnapping Wildlife

PAUL M. KELSEY

Each year sees more and more people pack up and head for the out-of-doors whenever possible. With parks filled to overflowing, many people find their way into the remote sections of the hills for their recreation.

This surge of humanity to the woods is accompanied by an unfortunate and unnecessary by-product — kidnapping of wildlife youngsters. Usually the foster parent's intentions are good, for the little animal is assumed to be an orphan and is being saved from starvation or the jaws of some predator.

Many birds will put on quite a show to draw intruders away from their young. Mammals, on the other hand, use a different approach. They will hide their young in a safe spot and trust on camouflage and the youngster's ability to remain motionless to prevent detection. The adult fades into the background so as not to leave any visible clue around.

The absence of the mother leads to the assumption that the youngster is an orphan. Occasionally some fate *has* befallen the mother, but unless circumstances are known she should be assumed to be alive. Kidnappings so outnumber findings of true orphans that more suffering is caused than prevented.

Wildlife Pets

Fawns and raccoons are the two animals most often victimized by kidnappers. After being held until they are capable of caring for themselves, coons can readily be returned to the wild, but this is not the case with deer.

A fawn requires milk for three months to grow properly. By that time it has lost all fear of man and cannot be safely released in the wild. The usual fate of a released deer is an early death due to unwitting exposure to dogs or hunters. This is probably very fortunate, for dur-

(Continued on page 15)

NEWS and NOTES on Environmental Education and Action

Action in Upstate New York

The Oswego, New York, Area Council for Educational Development initiated a special emphasis on environmental education in December, 1969, when former ANSS president William Stapp spoke to the Council on December 2. Many of the schools in the area reported their activities in environmental education, in a special issue of the council newsletter. The following are samples of the kinds of activity reported – ideas for action which can be effective in any community.

I

School Site Development

The North Syracuse Central School District in Onondaga County plans to create a 37-acre nature study area on school district property located adjacent to the high school.

Development of the nature study area will be carried out by students and maintenance personnel at minimal additional cost to the school district. The project was approved by the school board as a means of utilizing part of the 68-acre high school site for outdoor science, nature and conservation study and for community use.

Plans call for construction of a one-acre pond stocked with fish; an establishment of a coniferous tree plantation, a "natural succession" area, an upland meadow and a wetlands waterfowl area. The work will include planting various trees and shrubs.

Local school officials may obtain information on assistance for such projects from the Soil Conservation Service, 111 West First Street, Oswego, New York 13126.

II

About All Of Us

TEACHER: Mary C. White
Lanigan School
Fulton Central Schools

The students of Mary White's sixth grade class are finding an instructional unit entitled "About All of Us" to be very interesting and easy reading. The unit is taken from a set of books entitled "A Healthful Community Helps All of Us."

The students have had some interesting discussions concerning the unit. The better readers are doing research and writing short reports, to be read to the rest of the class, on what Fulton is doing about water and air pollution, water conservation, sanitation, etc. One of the students has visited Armstrong's new disposal plant and reported to the class on his visit.

Along with the unit, the students made a bulletin board that emphasized pollution. On the bulletin board, they put cartoons they had made, along with articles from magazines, which were concerned with pollution.

The class is currently trying to get the city engineer to speak to them on the city water and sewage systems.

III

Class Organizes Pollution Study

TEACHER – Mrs. Propeck
Fairgrieve School – 6th Grade

I have begun a unit on the study of pollution. The following is a brief outline of how the class organized their study:

A. Definition of pollution
B. Three general types of pollution
1) Air. 2) Land. 3) Water
C. Specific kinds, causes and effects of air, water and land pollution
D. Prevention of Pollution

Use of resource people, such as the mayor, to discuss questions such as:

1) What causes major pollution problems in Fulton? 2) What is city and state doing to make a cleaner city?

Possibly get a lawyer to help the class write a bill that could be sent to the state legislature to be introduced to the assembly.

We have, also, planned to take samples of water from creeks and study them for pollution.

Place posters in halls to show how each child can prevent pollution.

The following resources have been most helpful so far:

1) Newspapers. 2) Science World (Magazine from Scholastic) 3) The World Book Encyclopedia and Year Books – especially Yearbook 1966. 4) Science News – especially September 13, 1969, and September 27, 1969.

All statistics have been compiled by students in individual folders, in which they also paste magazine articles, pictures and newspaper clippings.

I have found this to be (so far) the most successful lesson I have ever taught, considering the lack of classroom materials. The children are extremely interested and very concerned about what is happening to their environment.

IV

ENVIRONMENTAL EDUCATION

TEACHER: Larry Egan
Grade 6, Fairgrieve School

Main Objective:

To get kids to look at their environmental surroundings with new eyes – which we hope will be concerned eyes.

Concepts: which will promote an interest, love and then a concern for the environment.

I. *Diversity*

To help the kids to appreciate the beauty and complexity of their environment.

Method: Make lists or start collections which illustrate:

1) How many kinds of trees in my neighborhood. 2) How many kinds of insects on the playground. 3) Birds, bodies of water etc., etc.

Take it from here and display collections, complete lists, debate and discuss value, etc.

II. *Function and Interrelationships*

How all things have a role in the environment – Air. H^2O, decay, waste, etc. All things relate to the total environment and we cannot destroy any link – food chains, etc.

III. *Adaptation*

The genius and beauty of design of plants, animals, etc., which permit them to adapt or survive. Colors, shapes, skills, sizes, etc. Make toothpick garden.

IV. *Change*

Observation of the value and genius of environmental change produced by natives – versus man's overnight destruction (eg. change of the environment.)

Environmental Education at Northern Illinois University's Lorado Taft Field Campus

The need to increase environmental education programs on the university level is particularly pertinent at this time. There are also specific needs to conduct research and to accelerate the exposure of future and in-service teachers to environmental concerns and their associated social problems.

The policy makers of tomorrow are the children in our elementary and secondary schools and the youth in our universities today. It is difficult for a voting citizen of today or tomorrow to respond to decision alternatives with

which he is unfamiliar. Based upon these premises and others Northern Illinois University established in 1954 a Lorado Taft Field Campus, a one-hundred-forty acre outdoor laboratory situated near Oregon, Illinois.

The backbone of this systematically evolving problem is the preparation of future teachers to utilize outdoor environments as a learning resource. Focusing on ecological approaches to environmental understanding and drawing upon multidisciplinary resources, the environmental study center directs imaginative programs for students from the social sciences, physical sciences, biological sciences, fine arts, industry and technology. The Department of Outdoor Teacher Education also conducts an international program, taking students abroad for first-hand study of European Outdoor Education programs.

The Department hosts at the Field Campus local, regional, and national conferences and workshops in the broad fields of conservation and environmental education.

— Donald R. Hammerman, Head
Department of Outdoor Teacher Education
Lorado Taft Field Campus
Northern Illinois University

Park Foundation Buys Land In Golden Isles Chain

Cumberland Isle is the largest and most southern of the islands of the coast of Georgia. Recently Secretary of the Interior Walter J. Hickel announced that the National Park Foundation, of which he is chairman, is purchasing approximately 8,300 acres, or about two-thirds of the island with a grant of $5 million from the Andrew W. Mellon Foundation of New York City.

This land will be held in trust by the National Park Foundation pending action by the Congress on proposals to establish a National Seashore on Cumberland Island. The first step in the program took place Sept. 30 on Atlanta, Ga. with the formal transfer of title of 3,000 acres from a corporation headed by Charles E. Fraser, a real estate developer, who also heads the Sea Pines Company of Hilton Head, South Carolina.

Subsequent purchases will be from several heirs of Thomas Morrison Carnegie, the 19th century industrial magnate, and brother of Andrew Carnegie. The island contains the ruins of Dungeness Castle, the 59-room mansion of Thomas Carnegie. The total land acquisition to be effected including the Fraser property, will involve a cost of approximately $5 million dollars.

Cumberland Island is the largest and southernmost of Georgia's Golden Isles. In addition to 17 miles of uninterrupted ocean beaches, it possesses subtropical oak and palmetto forests, and marshlands and estuaries which teem with wildlife and varied plant formations. To save the island for public use is a worthy project.

Legislation to create a national seashore on Cumberland Island has been introduced in the Congress.

Life Demands a Better Environment

Pollution of the environment seems to take many avenues. Noise pollution is one of these. Pollution by Snowmobiles is another.

Canada's National and Historic Parks Branch seems to be determined to allow snowmobiles to operate in the national parks. The Provincial Master Plans the Branch has issued for Kejimkujik National Park and Cape Breton Highlands National Park both make provisions for snowmobiles. In the Canadian Audubon Society's brief presented at the public hearing for Cape Breton Highlands National Park held in Sydney in June, they objected:

"This society heartily approves the prohibition of power boats and mechanical ski developments in the park, but objects strenuously to permitting over-snow vehicles and considers this concession quite inconsistent with sound park management.

"The national parks should be the last place on earth to permit such unnatural intrusions. National parks are sanctuaries for man, beast and plantlife and the noise and destruction that inevitably accompany the snowmobile should be banned from all national parks.

"If snowmobiles are tolerated, on what ground will it be possible to prohibit private hovercraft (now beginning to come off the assembly lines) and other all-season, all terrain vehicles?

Parks are for people, but people should not be attracted to them to partake of activities that are not directly and uniquely connected with the natural qualities of the parks."

California has its brand of environmental problems. The San Francisco Bay area is no exception. Arthur L. Ogilvie informs us that the South San Francisco Baylands Planning, Conservation and National Wildlife Refuge Committee has worked hard throughout the year and was given the award of Conservation Organization of the Year.

Mr. Ogilvie is the Recording Secretary of the Committee.

Dorothea (Dodie) Mulaik is the president of the Western Section of the ANSS which meets for its next annual meeting in June in San Diego, California. Dodie has also assumed chairmanship of the program committee which will provide activities for several days' activities. Papers, kodachrome showing and field trips will be featured.

Edith Curry, a past president of the western section has already provided much help in formulating a good session. All past presidents of the western section and current officers of the ANSS are urged to involve themselves at least by attending.

This meeting will be in conjunction with the Pacific Division of the American Association for the Advancement of Science and the whole convention will have perhaps up to 2,000 scientists in attendance.

Finding Birds in Mexico by Ernest Edwards will prove of value to those who plan a trip into our southern neighboring nation. A feature of this book which should appeal to many is the ecological approach. It is a comprehensive bird finding guide to all parts of Mexico. This is a completely rewritten edition with 212 Mexican bird species illustrated. Orders for the book at $5.50 paperback and $7.95 should be sent to Ernest P. Edwards, Sweet Briar, Va. 24595.

WORLD'S CARRYING CAPACITY

(Continued from page 4)

Vita-soy (a high protein beverage sold in Hong Kong) are considered by many people to be a "cure:" however these products have not been accepted in the underdeveloped countries in which they have been distributed, and their impact has been insignificant.

The most helpful solution to the problem is the development and production of new high-yield varieties of food grains. New breeds of rice could raise the present production level of one thousand to fifteen hundred pounds per acre in undeveloped countries to four to six thousand pounds per acre. Also being developed are new varieties of wheat and corn, hopefully with similar results. Unfortunately, this sudden switch from traditional to new grains may unbalance the ecology of an area. Or unknown pathogens could develop in a climate other than in which the grain is tested.

Unless population control is successful, however, the production of new foods will do little more than delay world famine. The earth's carrying ca-

pacity is limited, and no amount of modern technology can produce more food than the earth can raise.

(This item came with no title and with no author indicated.)

Design With Nature

Ian L. McHarg has presented the world with a view of man and his environment in a vivid book, DESIGN WITH NATURE. This is one of the classics of the times. McHarg writes with clarity about what man has been doing with his environment. He makes pointed recommendations for the future to give to mankind a better quality of life in the communities which he makes.

Lewis Mumford writes about this book in clear language. "Here are the foundations for a civilization that will replace the polluted, bulldozed, machine dominated, dehumanized, explosion-threatened world that is even now disintegrating and disappearing before our eyes. In presenting us with a vision of organic exuberance and human delight, which ecology and ecological design promise to open up for us, McHarg revives the hope for a better world. Without the passion and courage and confident skill of people like McHarg that hope might fade and disappear forever."

Ian L. McHarg has written widely. He is chairman and founder of the Department of Landscape Architecture and Regional Planning at the University of Pennsylvania.

DESIGN WITH NATURE is a publication of the American Museum of Natural History, the Natural History Press, Garden City, N. Y. 1969. 198 pp. Many illustrations. $19.95.

The following excerpt is typical of the entire book and those who would pose as interested in a better future should read it.

". . . There are many people who look to nature for meaning and order, peace and tranquility, introspection and stimulus. Many more look to nature and activity in the outdoors as the road to restoration of health. The best symbol of peace might better be the garden than the dove. But there are multitudes alive today for whom the cherished scene of their forefathers or their childhood has been defiled or obliterated in the name of progress. There is a smaller contingent who have seen areas redeemed by conscience and art.

"We need nature as much in the city as in the countryside. In order to endure we must maintain the bounty of that great cornucopia which is our inheritance. It is clear that we must look deep to the values which we hold. These must be transformed if we are to reap the bounty and create that fine visage for the home of the brave and the land of the free. We need, not only a better view of man and nature, but a working method by which the least of us can ensure that the product of his works is not more despoilation.

"Our eyes do not divide us from the world, but unite us with it. Let this be known to be true. Let us then abandon the simplicity of separation and give unity its due. Let us abandon the self mutilation which has been our way and give expression to the potential harmony of man-nature. The world is abundant, we require only a deference born of understanding to fulfiill man's promise. Man is that uniquely conscious creature who can perceive and express. He must become the steward of the biosphere. To do this he must design with nature."

ANSS and a Livable Environment

(Continued from page 6)

air scarcely fit to breath and with a promise that it may turn up lethal to most life.

The battle for a better environment to enjoy is to be fought on many fronts. Different groups will tackle different problems. Each group will have some specific local problems which will be their cross to bear in getting restitution for the destruction that has been imposed on the earth's bounty.

We are going through a period of change in social values and in our evaluation of the affluence which technology promised. There are severe social and civic concerns which are creeping to the front clamoring for attention. What "joy of living" can we extract from a world where our lakes and streams are being posted with "No Swimming" signs because of dangerous pollution? What "joy of living" can one hope for when ambitous politicians and industrialists crave for federal tax money to build giant airplanes such as the proposed SST which will pound us day and night with their intense sonic blasts?

There can be no "joy of living" for the vast numbers of people who have rushed pell-mell into the suburbs to escape the hordes who have come into the central cities to escape the onetime little rural homes and farms forced out by mechanized farming industrialists.

The migration of these masses of people from the farms to the cities is an entirely different phenomenon from migrations in centuries past. Today's migrants do not move from one area of agricultural activity to another, but enter into a ghetto where the promise of the future is dim, and the cage-like existence breeds a deep resentment to the futility of life. The desperation which this breeds expresses itself in careless, vicious hatred of the society of which they are a part.

Deep in their consciousness is a feeling that there might be a better life had they been able to remain on the farm, or in the small rural community where life had some tranquility; where the air was cleaner, where the sounds were subdued and mixed with the calls of birds and the stridulating of insects. In the country the snow fell white. On the back forty the creek yielded tasty sun perch or brook trout which the barefoot boy brought home proudly to the dinner table.

All of this is gone. Yet today there is more open space in America where no one lives than there was in 1900. By that date every little valley had a home nestling along its edges. Some have said that the decades around this date were golden years in the life of America. Since then farming became highly mechanized and the more or less self sufficient rural family living on often less than a hundred acres found the competition too great. Mechanization on the big industrially operated farms needed little human labor. The rush to the city seemed to be the only answer. At least there one might put his family on relief to be a burden to the taxpaying society. The country was largely emptied of people. The 400 farms abandoned each year in New York state alone made our wide open spaces even wider. — S.B.M.

Welcome New Members

Joann Bedient, Springfield, Mass.
George W. Bouska, Oregon, Ill.
Frances L. Cramer, Los Angeles, Calif.
Dixie Elementary Library, Louisville, Ky.
Handicapped Children's Nature Center, Bettendorf, Iowa
Brent C. Heath, Gloucester, Va.
James P. Jontz, Williamstown, Mass.
Katherine Laniewska, Flushing, N. Y.
Denni Liebowitz, Cincinnati, Ohio
Longden School Library, Temple City, Calif.
Drew Maser, Philadelphia, Pa.
Eva J. Mertz, Edison, N. J.
Monmouth Museum Nature Center, Lincroft, N. J.
Morningside Elementary School, North Charleston, S. C.
John C. Murphy, Ligonier, Pa.
Charles C. Ochs, West Chester, Pa.
Orchard Place School, Des Plaines, Ill.
Oregon State University Library, Corvallis, Ore.
David Porterfield, Zelienople, Pa.
Richardson Park School Library, Wilmington, Dela.
M. Edith Rutzmoser, Philadelphia, Pa.
Mrs. Daniel Smiley, New Paltz, N. Y.
Patricia Sussmann, Chicago, Ill.
Mrs. Ann Tanner, Glencoe, Ill.
Solly J. Thomas, Arnold, Pa.
Valley School of Ligonier, Ligonier, Pa.
Edward John Ward, Jr., Manchester, Conn.

WASHINGTON COMMENTS

National Park Service Sets Up Environmental Study Area Program

There is one web of life and you are part of it.
The web is in trouble
You can do something about it.

To the teacher: The Environmental Study Area (ESA) Program is a nationwide cooperative environmental education endeavor of the National Park Service and local educational communities. The program uses Environmental Study Areas located on Park Service lands and the regular curricula of participating schools, to help do things for school children:

1. Introduce them to their total environment – cultural and natural, past and present – and help them realize that they are part of it;

2. Develop in them an understanding of how man is using his resources;

3. Equip them to be responsible members of the world they are shaping and being shaped by.

An ESA provides a new kind of environmental learning experience that makes imaginative use of both the cultural and natural worlds, as they combine to make up the Environmental Study Area. ESA's also act as models to inspire establishment of similar sites outside parklands – areas which are nearer to participating schools.

Some Environmental Study Areas are primarily natural. They are located in park areas whose significance is natural or scenic. In them are exemplified the elements and forces and balances out of which man himself is made, and out of which he spins his cities and society and culture. Everything man is or builds, is "nature" before it is anything else.

Other Environmental Study Areas are primarily historical. Many of them became historical or cultural landmarks because of certain natural environmental factors – a rise of ground that formed a logical battlefield, or a desirable landing site along a river that grew into the national gateway to the West. In such places, a child learns to recognize how the environment has affected man's development and how man, in turn, has affected his environment. The environment and the individual become an indivisible whole – a reality whose meaning for each person lies in his own involvement.

If we, who are ourselves a part of nature, are to manipulate the materials of nature toward our uniquely human ends and to do so with creative rather than destructive consequences, then we must understand and work within the laws of nature. The child who would learn this lesson must approach it with the idea that he, himself, is as much a part of the natural world – as subject to its laws – as are the trees, the mountains and the seas.

An ESA can be a doorway to this realization. It shifts the focus of environmental awareness from "out there" to "here" – from "them" to "me."

Teacher workshops, conducted by National Park Service personnel in cooperation with the local school system, introduce you to the Environmental Study Area. Teacher materials provide a narrative listing of the area resources with suggestions for adaptation of the onsite experience to the entire range of curriculum.

At the workshops, emphasis is placed on dynamic interpretive concepts, or "strands," that bind the child's total environment, helping him see the relationships that exist throughout the universe – from the farthest galaxy to his own living room. The National Park Service supplies you with information on the strands, the workshops show you how to use them, and you decide how they best fit within your curriculum.

The strands are the constants that run through the web of life and give it the satisfying order that is sometimes called "balance of nature" – a balance mankind seeks to emulate.

These strands plus the ESA site resources are not a "subject" to be added to your teaching load. Instead, they are an endless source of lively new approaches to any and all of your present subject areas. The environmental strands can be applied to art, music, mathematics, history, social sciences, communications. Your use of this rich study resource will be limited only by your enthusiasm, inventiveness, and ingenuity.

The goal of the National Park Service Environmental Study Area Program is to create an environmental awareness that will lead the individual to a personal sense of involvement, and eventually to the shaping of an environmental ethic to guide his behavior.

* * *

For information on Environmental Study Areas write:

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

NORTHEAST REGION
National Park Service
143 South Third Street
Philadelphia, Pennsylvania 19106

NATIONAL CAPITAL PARKS
National Park Service
1100 Ohio Drive, S.W.
Washington, D. C. 20242

SOUTHEAST REGION
National Park Service
Federal Building, P. O. Box 10008
400 North Eighth Street
Richmond, Virginia 23229

MIDWEST REGION
National Park Service
1709 Jackson Street
Omaha, Nebraska 68102

SOUTHWEST REGION
National Park Service
P. O. Box 728
Santa Fe, New Mexico 87501

WESTERN REGION
National Park Service
P. O. Box 36063
San Francisco, California 94102

NORTHWEST DISTRICT
National Park Service
Room 1051, Federal Office Building
Seattle, Washington 98104

Kidnapping Wildlife

(Continued from page 11)

ing the fall a buck can become extremely unpredictable. Even pets that have been feeding out of hand all year may turn without warning on their benefactor with sharp antlers or hooves.

Because they cannot be released safely they must be kept in confinement the rest of their lives. Zoos, city parks and similar places which will take them are far too few to handle all the fawns that the "helpful" public will pick up.

Many people believe that once a fawn has been touched by a human that its mother will abandon it. Human scent is so common in most of our deer range, however, it is just an ordinary part of the day's smell. One farmer told me of finding a fawn in a field that he was plowing and moving it to the end of the field where it would be out of the way. Later that afternoon his children found it and he thought the doe would come out. Before dusk he saw the doe come out to the plowed field where she shortly found the fawn and they disappeared into the woods.

Many lessons about Nature's ways can be learned from wild pets. They need not be large pets, but can be small, easy to care for things like little snapping turtles, snakes, pollywogs or even large insects. The care and housing of these small creatures is simple compared with much greater demands of raccoons or fawns. When the urge to keep the pet runs out – and even caring for a fawn can become tiresome to a youngster and his parents – snakes, praying mantises, toads or most of these little animals can be released in the back yard with no problem.

Outdoor Education Bandwagon Is Crowded

STANLEY B. MULAIK

No problem exists for accumulating quantities of literature related to outdoor education. Films and slides are readily available and in excellent supply. Lecturers who could give a forty minute talk on outdoor education are likewise numerous from state and federal agencies, from garden clubs and other citizen groups. The literature, films and lecturers, however, can tell admirably what one could do if he did it; few of the bandwagon crowd, at least of the lecturers or writers of the literature, could lead a successful trip into the field, the woods or swamps or to ponds and streams.

The present bandwagon is crowded by school teachers and administrators. Tax money from the Federal Government has been available for many years. This is true throughout the nation. The elementary and secondary schools have seen the need for giving children a better understanding of their natural world; so committees have been formed to outline what should be done, but as has happened to many bandwagons of the past, the major background of the committee members, we suspect, was enthusiasm and desire.

Often the work of the committee consists of detailed outlines boot-strapped from accumulated educational literature, reviewing films and slides and listening to "authorities" who themselves had just jumped on the bandwagon. Too often these authorities are technicians with some agencies, though this must not be construed that there are none who know what schools need in outdoor education.

Basically what is needed by anyone who would lead children along a pathway of outdoor education is a knowledge of the outdoors which children need to know. They must know of the child related plant and animal life; of the physical interacting world; the ecological implications not alone in broad textbook generalities, but in species to species and individual to individual interaction and interrelation as observed in the outdoors. This is a big order, but the outdoors is a big complex, and it can't be understood from lectures, slides, articles and films. These have their best use, if used at all, as supplements and resources to give deepened meaning to the experiences in the out-of-doors.

Note is taken of the sudden appearance of experts on out-of-doors education who previously had no experience in the field. The one-weekend-a-year deer hunter becomes the expert on wildlife, and on outdoors in general. He might be the individual who protects the deer by shooting every mountain lion and bobcat he sees. He may be one who sights in his rifle on marmots and chipmunks which is beneath his dignity to consider them important for his skillet, and proud of his ignorance of their place in the scheme of things . . . the scheme of ecology.

He may be a representative from a federal agency whose major training emphasis developed him as a good technician and not as a conservation education expert.

Without equivocation, outdoor education should look to the air and how it is revealed to the eyes and nose. It should look at the dead birds in our communities following misguided overkill of insects. Visits to water courses will reveal pollution and a lack, compared to earlier years, of animal life and the presence of garbage of civilized communities. A visit to the fields of mountains and valleys will reveal that overgrazing has left a population of scarcely platable weeds. The floods from watersheds which are overgrazed, lumbered and burned by man's carelessness are now greater than indicated in the geology of recent millenia.

It is only as a student or an instructor involves himself through personal contact with the environment along a broad base is there a gain of a sense of what the outdoors is and what outdoor education might be. Outdoor education cannot be carried out in the vacuum alone of the printed page, the film, or the lecture. In fact, four walls are not necessary to any outdoor program unless the educationese is so strong within the teacher or administrator that he can't do otherwise. To take the youngster out and seat them on the ground in a weed patch to orient them to their environment is preferred if the spirit of outdoor education has captured the teacher. Let children discover through the soles of their feet the hummocks which earthworms cast up to set the stage for a broader experience.

A most devastating experience is the hour-long orientation to tell everything which the children are supposed to "discover" when they leave for the outdoors. Should the group go by bus to some destination, and then the leader hikes them for several miles, one can be assured that the instructor saw very little at any point along the trail, and so tarried very little anywhere. The excuse is made that the hike is necessary to curb their spirits. How dead their spirits would be had they stayed between four walls to see a movie of some other group taking a field trip!

Basically, then, the leader must be knowledgeable. It is not enough to be learning with the children. One who knows little about music can scarcely be a good music teacher, or one who knows little chemistry cannot look to much success in teaching chemistry. The days when teachers were proudly smug that they knew few birds, or trees, or insects, or much of anything, but that year after year they were learning with the children must best be forgotten. Some Utah teachers who for years taught about our cardinals and bluejays hadn't learned much about these birds which don't exist in that state. The pictures of these birds and the encyclopedic stories about them could hardly have been called bird study of any quality.

Outdoor education is a bandwagon going by. Those who jump on must devote much energy to becoming knowledgeable of the out-of-doors, for in this way the popularity of the bandwagon will live on for years to come. The reading of texts, the lectures on "what you could do if you did it" and having only enthusiasm, is not enough.

From Utah Education Review, March-April 1969

Nature Study

The journal of the American Nature Study Society

NATURE STUDY is published quarterly in March, June, September and December by the AMERICAN NATURE STUDY SOCIETY, and is sent to all members and subscribers. *Deadlines for* copy: January 25, March 25, June 25, September 25.

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Concerning manuscripts, notes, letters for publication, and membership news: address the editor.

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Fueled . . . by a million
wings of fire —
the rocket tore a tunnel
through the sky —
and everybody cheered.
Fueled
only by a thought from God —
the seedling
urged its way
through the thickness of black —
and as it pierced
the heavy ceiling of the soil —
and launched itelf
up into outer space —
no
one
even
clapped.

— MARCIA HANS

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