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Needed:

Total Community Involvement

for environmental education *(see page 1)*

The American Nature Study Society

Eco-Sense

We have a new member of the family at our house. In mid-June three young raccoons came ambling up the road, obstructing traffic and in danger of their lives, so we took them in. Coping with one young raccoon is enough (especially when you already have two rabbits and two cats), so two were sent away to live with other families. Max (for Maximillian) has now rearranged our daily routine to suit his tastes and seems quite at home.

Raccoons are amazing animals! We've had one on the cover of NATURE STUDY for many years, but I never appreciated those delicate digits on the front feet until now. Max uses them constantly, to "drink in", through the senses of touch and pressure, the richness of his environment. He probes, he fondles, he rubs with those icy-cold fingers (which must also be sensitive to temperature), all the while looking around in a sort of nonchalant manner. What is he **really** concentrating on? What he sees or sniffs, or what he feels? Probably all three, but I'm sure he takes in a lot more information through those fingers than one might think. Under stones in streams, under logs in woods, he "feels" out the edible and interesting.

Recently a weekly news magazine carried a piece about the three kinds of "sense" — physical sense, common sense, and nonsense — noting that there is plenty of the first and last, but that common sense is really quite uncommon. Our friend the raccoon displays a fourth kind of sense — **eco-sense.** It's a sort of combination of finely-honed physical sense which results in the accumulation of common sense. It's what nature study and environmental education are all about — and that's why the raccoon is on our cover.

Eco-sensitivity begins with a sharpening of the physical senses. As we absorb through all our senses what the natural and man-made world can teach us, our understanding of its meaning and of our relationship and response to our environment steadily increases. Eco-sense is common sense — the realization that the best ways of living and doing things are the ways which are **eco**-logical. Our home is not just our own lot or town or country, but the whole earth. Whatever we do should help to maintain the integrity of it all.

"Raccoons are the brightest people," as Sterling North has told us (in a book by that title). They certainly can teach us something about eco-sensitivity.

J.A.G.

TIPS *for Environmental Education and Interpretation . . .*

Environmental Education Requires . . .
TOTAL COMMUNITY INVOLVEMENT
. . . the New York State Plan

In April, 1973 the Temporary State Commission on Youth Education in Conservation of the State of New York issued its third and final report to the governor and legislature.* This report is, in effect, a Master Plan for Environmental Education in the Empire State. Taking a somewhat different tack than the environmental education plans of other states, it attempts to establish a regional system by which there will be "total community involvement" in a program of environmental education which touches every person for his or her entire life. It not only uses the resources of schools and colleges ("formal" education), but also taps the enormous resources of all other organizations in the community – industry, labor, media, citizens clubs, religious organizations, youth groups, government– the "informal" educational sector. The Report spells out a three-phased method of achieving this total community action– first, a *Constituting* process, second a *Correlating* process, and third a *Coordinating* process. The following, as excerpted from the Report, sets forth this program in detail. Several of the members of the Commission are active in ANSS: Nancy Ayers, Harold Evans, John I. Green, Daniel Smiley, and John A. Gustafson, who served as its vice-chairman in 1972-73. The Chairman of the Commission was State Senator Bernard C. Smith of Long Island.

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PLAN FOR REGIONAL ENVIRONMENTAL EDUCATION DEVELOPMENT

During the Commission's regional meetings it became evident that most communities maintain, and are striving to improve, environmental education in their region. This is true not only within the schools, but in other sectors of the community as well. Business, industry, agriculture, conservation, government, labor, citizen groups, and the media see themselves as having distinct contributions to make if a complete and successful environmental education program is to be implemented.

But often the efforts of educational systems, formal or informal, to work effectively are severely compromised by lack of organization appropriate to the task. The plan set forth here advocates a relatively simple organization to meld the wills and skills of these interests.

I. The Detailed Plan

A. FORMAL EDUCATION

Formal education is essential to any process which prepares citizens to play an active role in solving the environmental problems of their society.

1. *Pre-school* experience, whether in the home or through institutions, is important in the early attitude and value formation in any field. The environment is no exception.

2. *Schools, grades K-12*, continue building on early learning, developing the attitudes, values, awareness and understanding essential for an effective role as citizens in matters of wise environmental resource management. *Integration* in all subjects of appropriate knowledge relating to the environment, at all grade levels, is the most widely advocated method for assuring the approach environmental education demands.

Furthermore, there is wide support for education which has true relevance and meaning in the everyday life of the student, which can only be attained through the judicious blending of classroom and supplemental learning. For children, outdoor education is vital to developing perception of the natural systems that support us. Later, field experiences within the environments of natural and human communities are essential to understanding the complexity of environmental management problems.

Successful development of comprehensive and integrated learning experiences in the schools, which embody classroom, outdoor and community, are dependent on the following factors:

a. Wide public support.
b. Parental support.
c. Board of education support.
d. Support of school administrators.
e. Concern of teachers and their ability and willingness to participate.
f. Availability of outdoor education facilities.
g. Locally-related units of instruction, complete with written materials and instructional aids.
h. Stronger linkages between school instruction and the pertinent out-of-school educational activities of youth organizations (4-H, Scouts, etc.), as well as adult organizations having youth programs (service clubs).
i. Regional leadership and coordination.
j. State-level support and assistance, including access to curricular and instructional models and materials.
k. Adequate local funding.

3. *Higher education* strives for relevance in learning by providing experiences which permit first-hand study and evaluation of local environmental conditions and situations. The essence of such studies, if shared beyond the precincts of the college or university, can be of value to the community at large in helping to assess and solve its environmental problems.

Institutions specializing in teacher preparation and in training various professional specializations in environmental management provide further opportunities for sustaining the two-way relationship: opportunity to apply the results of these studies in regional environmental monitoring and control.

The research function of higher education has potential to supply new knowledge applicable to regional environmental

* Copies may be obtained by writing the Associate Editor. Emblem of Commission on front cover.

problems, the ability to evaluate the effectiveness of environmental education at all levels, and the capacity to devise and update methods appropriate to the changing needs and conditions within the community and society at large.

4. *Adult education* embraces a wide spectrum, from formal courses for which academic credit is given to a myriad of less formal learning experiences available through a wide range of community agencies and organizations.

B. PREDICTIONS FOR SUCCESS OF FORMAL ENVIRONMENTAL EDUCATION EFFORTS

In spite of the intricate organization of each region's formal education, the mounting fiscal problems at all levels, and numerous other obstacles to achieving a fully developed program, the future appears bright. Where the people of the region *want* these developments to occur, they can; the resources and control are largely in local hands. With a continuation and support of the beginnings even now in evidence, there seems to be good reason to believe that fairly substantial embryonic regional programs will develop in the mid-70's. Such confidence is based on the following evidence:

a. Regional leadership sees environmental education as urgent business: the will is evident; the ways can be developed and implemented.

b. The managerial elements of successful regional programs are present and becoming increasingly concerned and active.

c. Outstanding examples of active environmental education programs, designed and sustained by local educators to meet the specific needs of their community, are increasing. Although scattered and often partial, these programs are models of environmental education evolved almost solely on the basis of local impetus and concern.

d. Activities such as those sponsored by the Commission this year, which encourage and assist regional planning and development, have counterparts under other sponsorship. Evidence points to the fact that such activities encourage and enhance these coordinating efforts.

Despite this optimism, however, formal environmental education faces very real problems if substantial, sustained support does not soon become a reality. Such support must be realized internally at all levels of the institutional structure, and externally from the many informal educational sources within the community and from the state level.

C. INFORMAL EDUCATION

In its 1972 draft plan for environmental education in New York State, the Commission identified specific ways in which other groups – business and industry, government, citizen groups, conservation organizations, labor and the media – could perform essential educational functions. The Commission recognized the need to involve this *informal educational* system in regional development. The Commission unanimously concludes that the sustained, integral participation of informal education is fundamentally essential if truly representative and effective regional environmental education programs are to be realized. Although the sectors of the informal system differ from one another in commitment and resources, there are common activities which each can pursue to assure optimum growth of a total community involvement program:

1. Self-improvement of their own distinctive roles in environmental education, whether conducted independently or with other participating sectors. Improvement of each group's role through *internal* re-organization can be realized by taking the following steps:

a. Develop a simple mechanism for determining goals and creating processes that support regional environmental education needs.

b. Strengthen internal communications as they pertain to environmental education.

c. Implement a true spirit of cooperative sharing by identifying those resources – data, personnel, facilities, land, funds, and equipment – that might become available for use in regional programs.

d. Improve public relations by dealing with the public openly and personally, not seeking to avoid direct involvement by hiding behind advertising or promotional statements.

e. Meet regularly with leaders of other sectors to determine how joint efforts, using all resources available, can best respond to regional needs.

2. Development of working relationships with other sources of informal education to accomplish regional environmental education objectives.

The collective efforts of the informal system can best be applied to a community-wide educational program. Only the diversity of resources and expertise of a broad, collective effort can effectively respond to regional needs. The ability to form *ad hoc* relationships, sensitive to concerns of regional magnitude, is the essence of such involvement.

3. Establishment of a permanent alliance between the region's formal and informal educational systems to assure an effective, two-way flow of information and services and to attain the goals of the regional program.

In direct support of the formal educational system, the collective effort of the informal sector can provide immeasurable assistance by:

a. Organizing and promoting the growing public demand for efforts to develop comprehensive regional environmental education programs.

b. Cooperating with formal education to:

(1) Develop the new "realistic" curricula that educators and students are calling for.

(2) Share facilities, land, technical manpower and other resources.

(3) Focus regionally conducted and/or supported research on local problems, thereby producing knowledge relevant to education based on local conditions and issues.

(4) Provide assistance to formal education in developing research proposals to investigate regional environmental problems.

II. The Summarized Plan

A. THE CONCEPT

Each region has expressed its goals in ways that are specific to the environmental conditions and needs unique to it. Yet upon analysis, all of them support a plan for *total community involvement* in environmental education as the best means for achieving these goals.

B. THE PURPOSE

Although expressed in different ways and at different levels of sophistication, the broad goal for environmental education is similar for all regions: *To have all persons of all ages achieve that awareness, understanding, and commitment required for effective action in maintaining and improving environmental quality.*

C. THE AUDIENCE

Environmental education is not to be reserved for any particular segment of society nor to any age group. The overwhelming consensus is that *the audience must be the region's total population, each person engaged in a continuing learning experience extending throughout his life.*

D. THE LEARNING MODES

Complete learning experience comes by two educational pathways, *formal* and *informal.*

1. *Formal Education*

Formal education consists of all learning experiences provided by institutionalized education, pre-school through adult, focusing largely on the general problems of environment and their solutions. Formal education is the primary source of generalizations concerning the environment and serves to create awareness and understanding of universal problems.

2. *Informal Education*

Informal education consists of learning experiences derived primarily from local non-institutionalized sources of education including business, labor, industry, agriculture, government, conservation organizations, citizen groups and the media. Informal education focuses on the specific environmental problems within a region. It uses the reality of immediate experience and analysis of its findings to corroborate general environmental conditions, thereby providing the basis for immediate and personal involvement in their resolution.

CONSTITUTING PROCESS

— used by each organization in the Informal Education System

Figure 1

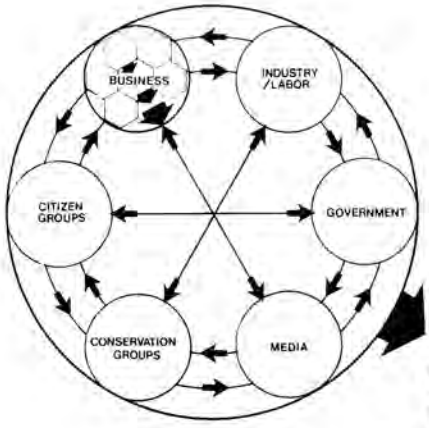
E. THE PROCESSES

Total community involvement requires three primary processes functioning concurrently and providing mutual support in pursuit of a common goal – *constituting, correlating,* and *coordinating.* The first two are primarily the responsibility of the informal educational system, the third a joint venture between formal and informal education.

The Constituting Process (Fig. 1)

The process which creates *internal structure and organization* in each unit of the informal educational system which will help to establish their individual potentials for participating in regional environmental education.

This is largely an internal process employed by the organizations of the informal educational system to assure integrity and precision in their roles as full-fledged partners in the development of regional environmental education. Each sector of the community strives, individually, to define, improve and enlarge upon its own environmental education potential through continuous review and refinement of its goals and assessment of its pertinent resources. Each sector formulates unique ways whereby it can make commitments to the regional program which are in harmony with community objectives, and yet reflect its own internal interest and policies. The constituting process also includes the techniques which can



CORRELATING PROCESS

— between various sectors of the Informal Education System

Figure 2

successfully link each sector of the informal educational system to the other sectors, thereby assuring the basic integration essential to effective action.

The Correlating Process (Fig. 2)

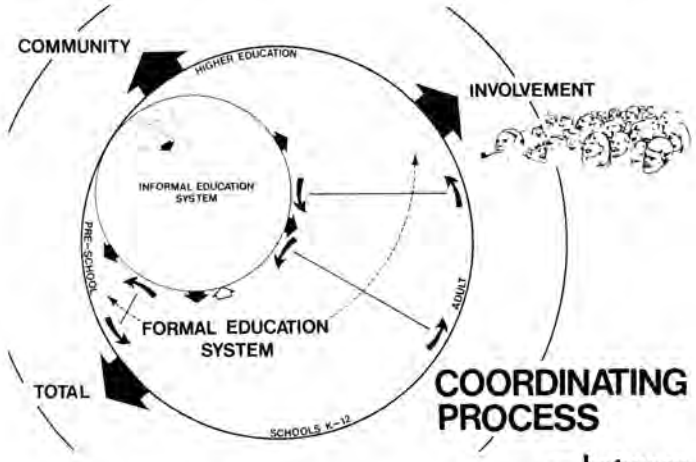
The process which brings the organizations of the informal educational system together in *mutual relationship* to facilitate their collective work in regional environmental education.

The entire informal educational system acts together to develop unity among its diverse elements in the cause of environmental education. The correlating process seeks to clarify and interpret goals for environmental education among its participants. It creates the support for a variety of learning experiences which can maintain that level of environmental literacy prerequisite to stimulating meaningful citizen action. The bringing of all sources of informal environmental education into mutual relationship is the principal effect of correlation.

The Coordinating Process (Fig. 3)

The process which brings the formal and informal educational systems together in *proper order and relationship* to achieve *total community involvement* in environmental education.

The final link essential to forging a strong and lasting bond between the formal and informal educational systems and thus



COORDINATING PROCESS

— between the Informal and Formal Educational Systems, bringing about TOTAL COMMUNITY INVOLVEMENT

Figure 3

realizing total community involvement, is that which brings their distinctive contributions together in proper order and relationship. Difficult as this relationship may be to create and sustain, the absence of such coordination will ultimately defeat any truly comprehensive approach to regional development. Coordination requires the establishment of a permanent operating dialogue, identification of shared goals, maintenance of a productive working relationship adaptable to a variety of changing needs and organization of an appropriate vehicle to sustain a unity of purpose among the cooperating sectors. Its special challenge lies in inventing techniques which can bring together, in harmonious conjunction, two systems traditionally very different in mission and method.

F. SUMMARY

This plan responds to the need expressed through the Commission's regional meetings, that environmental education be *action oriented* and that it occur at various levels of concern, experience and ability. It recognizes that citizens generally have become aware of environmental problems but only in rare exceptions have achieved the level of understanding and motivation necessary to participate in making effective decisions.

The plan identifies the essential role of institutionalized education in delivering the knowledge required for citizens to take effective action. At the same time, it assumes an indispensable role for all components of informal education within the community. It realizes that to be truly effective environmental education requires a breadth and depth of learning experience that only total community involvement can provide. The plan, moreover, promotes the utilization of resources indigenous to the region, thereby necessitating only minimum assistance from outside and assuring a high degree of relevancy for the region and its needs. It places primary emphasis for achievement of environmental education on regional organization, and suggests that the full development of a multilevel process and its management is the best assurance that a successful program will be created and sustained.

A Word From The President

The need for an environmental ethic is evident in many countries of the world. I have just returned from a five-month working sojourn in England and a one-month tour of the continent and the situation looks about the same all over.

Great Britain, and particularly England, is suffering from overpopulation and a degree of industrialization that is pressuring that environment to the breaking point. Although they are working on these problems my observations indicated that the average British subject has about the same disregard for his environment as I have repeatedly observed in our own country. I stood on the deck of a day-steamer sailing on Lake Windermere, in northwest England, and watched a teenager throw an empty pop bottle into the lake. When I asked him if that was what he did with all his trash he replied, "Oh, it's okay because it all sinks anyway." So it was the same attitude we generally encounter, i.e., if we can get it out of sight it is no longer a problem. It has been "thrown away."

I found, too, that industrial smog from central England is "washing out" over Scandinavia causing considerable sulfuric acid damage in those countries. This, then, is a large-scale manifestation of the same syndrome. If the smog has blown away then everything is fine because the irritating stuff is out of sight. The point is, of course, that environmental problems are global problems and the solutions to these problems will come as the result of world-wide changes in attitudes. How different are the attitudes of the teenager tossing the bottle to sink into the lake and those of the industrialized nation letting its atmospheric wastes drift over some other land mass?

We have recently joined forces with twenty other environmental education organizations, with a combined membership total of 11,330,000, to form the Alliance for Environmental Education, Inc. We are proud to have John Gustafson represent us in this concerted effort as one of its newly-elected officers and we shall be happy to work, in any way possible, with the new organization. It is my fervent hope, however, that this will not be simply another proliferation of similarly oriented organizations but rather a means of pooling information, expertise and efforts in the years ahead.

This alliance in no way diminishes nor demeans the role that ANSS has played and will continue to play in the future. We will continue to encourage, support and initiate the kind of education that brings about an awareness of the complexities of the environment in the hope that attitudes and human behavior will fall into a pattern of maintenance and survival rather than "progress" through exploitation.

— K.L.G.

ANSS Receives Award From EPA

Along with a number of other organizations, the American Nature Study Society has been given an Environmental Merit Award from the Environmental Protection Agency of the United States Government. EPA administrator William D. Ruckelshaus made the award in March 1973. Forty-eight of the country's major national organizations for youth were among the recipients, representing all areas of private agency and organizational programs for boys and girls.

Through the summer camp programs of many of these organizations, children who complete the requirements in study and work projects at their camp will become eligible for the President's Merit Award or Award of Excellence, and will be presented with an embroidered patch for their camp jacket. The insignia carries the Agency's slogan "Life – Pass It On."


United States Environmental Protection Agency

PRESIDENT'S ENVIRONMENTAL MERIT AWARDS PROGRAM

COMMENDS AMERICAN NATURE STUDY SOCIETY

For exceptional service to the Nation in inspiring and guiding youth toward restoring and preserving our living environment.

SIGNED William D. Ruckelshaus ADMINISTRATOR

DATE March 1973

Nature in the Movies

MAXWELL C. WHEAT, JR.

The news early this year that a heretofore unknown Herring Gull had been found for the lead role in the movie "Jonathan Livingston Seagull" has called attention to the important and extensive use of nature that is being made by the film industry. The Australian wilderness emerges with character-changing force in 20th Century-Fox's "Walkabout." The graphically filmed Mendocino Coast of northern California gives more meaning to the love story in "Summer of '42."

What is coming across about nature to the students who, as teachers are well aware, would rather spend time at "the flicks" instead of doing homework? Are they leaving the drive-ins or theatre buildings with newly-stirred, but vague feelings about nature? Feelings that might be made more articulate for them through follow-up classroom discussions or field trips to experience the out-of-doors directly?

These questions are appropriate because the movie makers are doing significant things with nature. "Jonathan Livingston Seagull," taken from the book of the same title and due in the theatres in 1973, uses the bird as author Richard Bach did to make a statement about the individual's need for freedom and self-fulfillment.

Jonathan could be a person talking about being human when he says in the book, "A seagull is an unlimited idea of freedom, an image of the Great Gull, and your whole body, from wingtip to wingtip, is nothing more than your thought itself." But producer Hall Bartlett needed the Marlon Brando or Jack Lemmon of the gull world to convey this idea. So a bird trainer was sent forth to capture gulls and test them for their ability to be instructed until the right one was discovered.

There follows a serious question. Since the gull is being utilized to make a statement that is really about the human being, does it follow that the theatre-goer will identify to some extent with this bird? Will that person later watch more sensitively when observing a gull skimming the ocean's breaking surf or a lake's rippling surface? Will that person, by some kind of transfer, be able to feel that the gull's flight can be expressive of his or her own mood?

Perhaps these questions can be partly answered at least by taking students to see the movie and then as soon afterwards as possible (even the same day) taking them to a shore where they can watch gulls soaring. The students could be encouraged to note down what they see – or to actually write descriptive paragraphs or paint pictures of what they observe. Then maybe they could be guided to metaphorically use what they see to express their own thoughts and concerns.

"Walkabout," from the book of that title by James Vance Marshall, involves a teenage girl and her eight-year-old brother who are lost in the Australian wilds. An Aborigine boy finds them. He guides them through hundreds of miles of desert and forest in which close-ups are shown of the fascinating "down-under" reptiles, amphibians, mammals and birds.

The land and wildlife is always shown as impersonal. This is brought out in the predator-prey scenes that show creatures gulping down other living forms. These scenes include the Aborigine youth who is shown lunging his spear into the flesh of animals like the kangaroos.

Yet, paradoxically, this impersonal nature is depicted as a humanizing force. The Aborigine boy is shown as being already humanized. Although he can kill instinctively for food, his eyes in a close-up study reflect dismay at the spectacle of civilized men gunning down animals around a waterhole and leaving the carcasses behind.

You see the humanization begin to stir in Mary and Peter. This contrasts with their failure to show emotion over their father's death at the film's start. The little boy develops feelings of companionship and dependence for the older Aborigine youth. Mary becomes aware of growing sensuous and emotional attachment to their guide. But her feelings are not culminated, raising the issue of how much hold the natural scene can have on today's urban people.

As a back-up to the story's conflict, glimpses of modern-appearing urban people, streets and buildings are shown side-by-side with scenes of the three youngsters in their wilderness environment. But there is no sign of personality in the city as there is in the natural setting. The pedestrians and automobiles could almost be interchangeable. Yet, as the film reveals, this urban life still has its hold on the girl and her brother. This film can lead to classroom discussion and writing about what style of life is preferable or perhaps even inevitable.

The sensitively photographed California coast adds meaning to "Summer of '42," which is also a book. Nature is not the force in this picture as it is presented in "Walkabout." But it demonstrates that beautiful natural scenery can provide a dimension of meaningfulness to a movie.

Some viewers may not be able to accept the situation in "Summer of '42." It involves a brief affair between a teenage boy and an "older woman" of 22. But there is human tenderness in the relationship. This expression of tenderness is a meaningful aspect in itself. It just seems to go better against the coastal background shown so graphically that the theatregoer can almost imagine himself a part of it. The beach plants, for example, are shown in such detail that a botanist could identify them on the screen. All that can really be said is that the tenderness shown by the two main characters seems so much more human in the lovely, identifiable natural environment of this coastal area.

Certainly, movies are showing impressive natural backgrounds with increasing frequency. At least one interesting error has appeared. This was a scene in "Sounder," produced by 20th Century-Fox from the Newberry Medal book of that title by William H. Armstrong. It portrays the struggles of a black share-cropping family in 1933. The year is flashed on at the beginning of the movie.

Filmed in Louisiana, one scene shows a flock of cattle egrets flying up from a herd of cattle. These large white birds run underfoot among the cattle feeding on the insects stirred up by the animals. Hundreds of cattle egrets can be seen in a single pasture. You can see them from car windows when driving through the southern states.

But in 1933 a single cattle egret in North America would have brought ornithologists from all over to see it. In fact, it was in the early 1930's that these birds were first being seen in South America. They are common birds in Southern Europe and Africa. Then they began appearing in South America in increasing numbers. Twenty years ago they invaded the United States and can now be used as scenic background for a southern-based movie with a *contemporary* setting – but *not* for a movie set in 1933!

With the increasing use of natural settings in movies, teachers might find interesting results and perhaps even interesting teaching units in exploring with students their attitudes about nature – attitudes that are being influenced by the movies.

Whitefoot, As A Boarder

ANNA BOTSFORD COMSTOCK

Our first experience with Whitefoot was at our cottage on a woodsy shore of Lake Cayuga where these deer mice, or wood mice as they are also called, occupied the cottage brazenly during our absence and discreetly during our presence there. One year they took the cotton out of a comfortable and packed it into the pocket of my sport skirt hanging in a bedroom, and they minced paper and cotton and built nests in the drawers of our desks; they were very clever at getting at the food in the tins on the shelves by pushing the tins onto the floor thus knocking the covers off and giving them access to the rice and other edibles thus stored; but the greatest indignity they put upon us was the way they used our soap dishes as receptables for their excrement; the shelves and tables were very free from any of their droppings but the soap dishes were a sight.

While we occupied the cottage we saw them occasionally and sometimes would find that they had nibbled a cooky or some other sweet, but they did very little damage to food; often in the night we could hear them squeaking, and twice I heard what I was sure must be their song since the soft, even though shrill little warble sounded mouse-y and the whitefooted mice were our only other tenants.

Our home in Ithaca is next to a woods on the bank of Fall Creek Gorge; the first sure evidence that Whitefoot had come to live with us here was given when we found one in the cushion in a nice little nest on the back of the lounge when we removed it from the piazza in the Fall. Later we saw signs of them in the kitchen. Their depredations are not at all like those of house mice; they eat only sweets and forced me to change the sugar from a drawer in the kitchen-cabinet to a pail with a tight cover; they also influenced me to put a similar cover on the cooky jar; they ate apples in the cellar in a most polite and considerate manner devouring one completely before attacking another, and never making a mess in the apple bin. However, the most notable performance was when one of them used the drawer in the bureau of the guest room on the third floor as a store house. During Spring house-cleaning we removed the sheets belonging to the guest bed from the drawer to dust it and there, hidden in one corner with never a nibble into the sheet above it were the following whitefoot edibles:

3 pecan meats – taken from the dining room sideboard on the first floor;
2 cough drops – from my desk on the second floor;
24 pieces of starch of varying sizes – from the laundry in the basement;
2 soda mints from my desk;
4 bits of pie crust, evidently purloined from the garbage pail in the kitchen.
1 chocolate cream from my room.
76 sunflower seeds from a dish in the bay window of the dining room, kept there to replenish the feeding basket for the birds just outside the window;
104 apple seeds taken from my husband's study; he has the habit of eating an apple just before retiring. We had noticed that the mice were enjoying the parings and core left on the plate.

It seemed remarkable to find all these things hidden in the drawer, carried there from every part of the house and yet done in such perfect silence that we never suspected it.

Whitefoot has true grit as the following instance will show. A short time ago I found a young whitefoot skidding merrily around the kitchen and I thought I would make a pet of him, so I put him in a goldfish jar with a little dish of water, and another of milk and some cake and gave him plenty of paper strips to cover him and make him feel safe. All went well for a day and I thought I would clean the jar, so I picked him up; he was such a tiny, soft, satiny, bunch of fur that I never thought of his biting, but he set his sharp teeth in my finger just like so many needles and would not let go; the pain was severe but I was afraid of hurting my tiny

PHOTO BY LEROY BEHLING

Reprinted from "Nature-Study Review," Sept. 1923. See p. 15 for historical note.

assailant if I shook him off so I held my hand under him until he let go, it seemed to me after five minutes but probably not more than two; but that effort on his part was too great a strain on a baby mouse and he dropped dead as he let go of my finger; the plucky little rascal had used up all his strength in his last bite and I said, "You poor, little misguided hero," and then bathed my bleeding finger in antiseptic.

The funniest thing Whitefoot does is to play. I kept some English walnuts in a pasteboard box in the china closet; every morning we would find one of these, still intact, on the bare floor by the dining room door. One evening I chanced to discover the game, when I was busy in the butlers pantry and the dining room was dark; I suddenly heard a nut rolling on the floor with a great racket, rolling evidently this way and that, just as if a kitten were playing with it. I listened for some time until I was convinced that a mouse was rolling it for fun and I tried to see the game, but by the time I had the light turned on, the nut was there and the mice were gone. Another evening I had the same experience and one day the cook saw a mouse playing with a nut under the kitchen table and said that he pushed it this way and that and hopped around it like a kitten playing.

Occasionally some member of my family threatens to set traps for Whitefoot, and I smile serenely for I know that this mouse is too clever to be trapped and I am glad of it. I must confess that I find Whitefoot an interesting little boarder; to be sure I often find him living in my desk but he is not smelly like other mice and he is so pretty and so clever that I find life more interesting because he has chosen to board with me.

Welcome New Members

Blackwell Library, Salisbury State College, Salisbury, Md.
John Briggs, Missoula, Mont.
Carolyn Carlson, Rocky Point, N.Y.
Richard L. Cunningham, South Wellfleet, Mass.
Environmental Education Report, Washington, D. C.
Florida Audubon Society, Maitland, Fla.
William G. Foster, Collegedale, Tenn.
Hanover Conservation Council, Hanover, N. H.
Gary D. Harvey, St. Louis, Mo.
Joanna B. Hills, Norwell, Mass.
Wendy Holmes, Bronx, N. Y.
Houston Museum of Natural History, Houston, Texas
John W. Kominski, Flushing, N. Y.
Jay S. Mallery, Vestal, N. Y.
Mrs. Gladys Meusel, Orange, Conn.

Continued on page 8

Another report from our "Yankee in Europe" . . .

Up An Irish Mountain

Richard F. Fleck

We turned back mad from the mystic mountains,
All foamed with red and with elfin gold:
Up from the heart of that twilight's fountains
The fires enchanted were starward rolled.

— A.E.

It was a bright October day when I left my residence in County Monaghan, Ireland to drive up to the base of 1,894 foot Slieve Gullion in County Down, Northern Ireland. I passed miles of rich farmlands with bright green fields separated by thick hedgerows of reddening hawthorn bushes and blackberry vines. Occasional majestic beech trees stood lonely in the fields with gigantic twisted trunks looking like gothic arches. Clumps of chestnut trees tinged the landscape with bright yellow leaves, and dense flocks of crows always seemed to hover around each ridge of land that I passed. In the distance loomed the brown slopes of Slieve Gullion, ringed with a pine and spruce plantation forming part of the reforestation program of the Emerald Isle.

Parking my car at the entrance of Slieve Gullion Forest Park, I walked up to a posted map of the mountain to determine my route to its summit. The planted trees of Sitka spruce, Scots pine, European larch, and Common yew strongly scented the air, and Blackcap warblers chirped in some branches nearby. Pleasant forest areas such as this one are a small part of the hundreds of plantations from Antrim to Kerry where unused farmlands are gradually becoming thick woodlands under the sponsorship of the Department of Lands in the Free State and the Department of Environment of the United Kingdom's Ulster. In addition to being timber "gardens," many of these plantations serve as outdoor nature study areas for forestry personnel as well as naturalists and environmentalists. A number of nature trails have been established by both North and South Irish governments affording the public a great opportunity to learn more about the land and woods which surround them.

I hopped back in my car and drove up to the trailhead some five hundred feet above. Patches of green fields and rolling breys in a delicate veil of mist gradually spread below me until I could see into five counties. Again I parked the car, grabbed my lunch and anxiously started walking up a steep trail climbing a slope of pink-flowered heather and prickly whin bushes. Patches of stinging nettle grew in and around blackberry vines laden with juicy berries. Slieve Gullion's velvety summit rose high above, seemingly distant and unapproachable. As I paused to rest a moment, I was startled by the sudden fluttering of the wings of a white wagtail flying for safety from this human intruder. In the far valleys below, several magpies lingered in the air reminding me of my own western United States. From far below, I could hear the wind in the pines and, from even lower depths, farmers' voices. Everything seemed so peaceful until I heard the sudden bursts of machine gun fire ringing out in the distance. The guerilla war between the outlawed Irish Republican Army from the South and the occupying British military forces in the North had flared up again, but I knew that Slieve Gullion was hardly a strategic area and that I was safe. After the firing had stopped, the overwhelming stillness of this Irish mountain gripped the air, and nature ruled once more.

I descended a small vale to arrive in a thick and oozing peat bog with clumps of ferns and rich green moss. Part of the bog had been cut to drain. Eventually bog farmers would haul out tons of thick brown peat or soft coal for turf fires in the cottages below. A fairly large black bird called a chough flew overhead with the sunlight catching his orange bill. I had to be very careful crossing the bog by stepping on vegetated clumps, or I would sink up to my hips in watery moss. When I got across, I climbed up some steep granite rocks covered with loose and treacherous moss. Suddenly slipping, I grabbed an exposed root as I would have done in the Rockies, but the root pulled right out of the moss, and I fell backwards into a boggy hole. Mountain climbing here is a wee bit different, and one has to take unusual precautions.

When I got back up over the rocks, I came across a blueberry vine with several ripe and sweet blueberries almost coal-black in color. Slieve Gullion's summit looked a lot closer now, and I could even make out the pile of boulders on its misty summit. The winds became sharper, and I felt as cold as a wandering Medieval knight as I slowly trudged

closer to the cairn marking the highest point. Finally I splashed through some wet trail ruts cutting deep into the peat to reach the base of the windy summit. It was quite apparent that these many granite boulders had been piled up here over the years by various generations of farmers, but, when I entered a man-made cave with gigantic slabs of granite forming its walls, I began to wonder if indeed the legendary giant named Finn MacCool had not piled them up here on the top of Slieve Gullion.

The last one hundred feet or so above the cave proved to be quite easy, and when I stood on the summit I could see far out into the grey-green Irish Sea. The east coast of Ireland from Drogheda to Belfast stretched below me, and thousands of rich acres of patch-work farmlands spread to the west with smaller rolling hills which blended into the misty horizon. Silver ribbons of various rivers wound their way to the sea, and droves of sea gulls flew below me. I noticed a small lake called Calliagh Berras Lough perched on the lower northern summit. All that I could do was turn slowly in circles staring at each and every angle into a universe of green. Grey clouds began to spread in the western sky, and so I began my downhill trek through bogs and heather to my car.

Returning to County Monaghan, I passed farmers digging potatoes under swaying weeping ash trees and the first evening star. I reflected that this trek up an Irish mountain was one more timeless tonic for me. By the time I arrived at my little Irish cottage, I had composed in my refreshed mind some lines of verse:

Climbing ever upward, I began to see
Silken mist betraying vales where
Farmland patches spread afar with
Quilts of fields filled with heather
Stretching under misty clouds
Puffing all around an arching ridge
Standing still above a universe of green,
Greening my mind and soul for many days.

New Members

Continued from page 7

Micro Media Library, Orb Institute, Washington, D. C.

Carol Morgan School Library
Santo Domingo, Republica Dominicana

William A. Moth, Syracuse, N. Y.

Mr. and Mrs. John C. Mulhall, Littleton, Mass.

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Catherine T. Reed Elementary School, Lanham, Md.

Katherine Rill, Oshkosh, Wis.

Wade C. Sherbrooke, Tucson, Ariz.

Jeanne Svitesic, Glenshaw, Pa.

Donald Wells, Fayetteville, N. Y.

C. Whiskeyman, Elkins Park, Pa.

GOOD READING

Ben Hall

The Nature of Time by G. J. Whitrow. Ill. with diagrams. Holt, Rinehart and Winston, New York. 1972. 191 pp. $6.95.

At first thought, one might think that such a book as this was of no immediate concern to the biologist, but was meant for physicists, astronomers, or mathematicians. Yet it is of interest to the naturalists, too, since time is an important dimension of life.

The naturalist is, for instance, much concerned with the changing seasons, which are such a prominent feature of the flux of time. Who hasn't wished he could slow down the spring in order to perceive more vividly the phenomena of the season's changes? Then there are such temporal phenomena as the migration of birds and other animals, and the biological clocks that seem in some way to be built into the behavior of such a diversity of living organisms. I, like many others, have an internal clock mechanism that enables me to get up regularly in the morning without using an alarm clock. There is also, of course, Evolution, the most far-reaching concept in all biological thought. *The Nature of Time* makes one realize that time has a great deal to do with natural history.

Among the many aspects of time that this book deals with is the concept of time being linear, which we now take for granted, as compared with the older idea of cyclical time. And then there is "Time's Arrow," the flowing of time in one direction only, whereas most natural laws would equally allow of time proceeding in the opposite direction. (History does not repeat itself, exactly, despite the common assertion that it does, because the chance that all the events of a past time could appear together again at one moment is such an infinitely minute one. That is why evolution does not reverse itself.) Another concept that has much to do with biological phenomena is that of Entropy: the idea that the universe is "running down," becoming increasingly disorganized. Thus life processes, all in all, represent a limited uphill trend toward increasing organization, within a broader, over-all "downhill" trend.

This book is by no means entertaining or easy reading; but it is as thought-provoking and stimulating as it is difficult. I have had to pore laboriously over passages that the author probably thought were quite clear, before I could grasp their meaning. Perhaps this is because the style of the book is too concise; it might have been more readable if a greater number of pages were devoted to covering the same material. Or it might be that I am not adequately equipped with information that could make the book's ideas easier for me to grasp. Nevertheless, it has left me with much to think about that is of interest to a biologist, and I'll probably read it again.

* * *

Look at a Flower by Anne Ophelia T. Dowden. Ill. by author. Thomas Y. Crowell Company, New York. 1963. 124 pp. $4.50.

Although college and university are important in the training of a botanist, I find that most of the botanists I know had already acquired a good deal of knowledge about plants before they came into contact with formal botany courses. Thus they were at least partly self-educated. The fields and woods served as their laboratories before classrooms did, and their tools were simple ones. A great deal can be learned about plants without any aids beyond the outdoors, helpful books and perhaps some sort of magnifying glass. And, of course, a curious mind and eyes that delight in seeing.

If you want to encourage a young person (or one not so young, for that matter) to learn about flowering plants you couldn't do better than to give him a hand lens and a copy of this book of Mrs. Dowden's. (If you are unacquainted with Mrs. Dowden's work, by the way, as both writer and illustrator, see her article in the May, 1973 *Audubon* magazine.)

It is difficult to say which means of communicating information about plants Mrs. Dowden uses most skillfully: printed text or illustrations. Both communicate not only information about plants but pleasure in their beauty. Both prose and paintings are perfectly suited to their purpose. The topics dealt with are: plant classification; the general (vegetative) structure of plants; pollination and seed production; flower parts; types of flower clusters; monocots and dicots; then follow ten chapters, each describing briefly the characteristics of a major plant family. A bibliography of sources of additional information would have been a useful addition to this book.

* * *

Wild Green Things in the City: A Book of Weeds by Anne Ophelia Dowden. Ill. by author. Thomas Y. Crowell Company, New York. 1972. 60 pp. $5.95.

PESTICIDES *And The* *ENVIRONMENT*

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PESTICIDES
And The
ENVIRONMENT

GAYLEN NEUFELD

The usage of pesticides is an emotional issue which has generated bitter controversy particularly in the last decade and beginning with the publication of **Silent Spring** by Rachel Carson. Some contend that the use of pesticides provides the only way to meet the food needs of an increasing population and to allow the agriculturist to remain economically viable. On the other hand, many see pesticides as an agent of destruction which is leading to the extinction of wildlife and may in time have a similar effect upon humans. Unfortunately, many of the arguments made for or against pesticides are made out of ignornace. A rational approach needs to be followed which takes into consideration the dangers of pesticides to the world ecosystem as well as the economic necessity which an affluent society has created. This issue of **The Kansas School Naturalist** will discuss some of the aspects of the pesticide problem. Hopefully this will help clarify the issue and allow the reader to recognize the ways that pesticides exert their effects and what measures can be taken to provide a safe environment for future generations.

This issue of **The Kansas School Naturalist** was written by Dr. Gaylen Neufeld, Associate Professor of Biology at KSTC. He is a cellular physiologist with a research interest in pesticide biochemistry and physiology. Illustrations by Robert Boles.

The Cover: Man is faced with a dilemma when confronted by crop-destroying insects, competing plants called "weeds" and other pests. The use of pesticides provides a way to deal with this competition but they may also affect organisms which are beneficial such as the robin, earthworm, praying mantid, ladybug beetle and many others.

History of Development and Use

Extensive use of chemicals against insect pests began less than 100 years ago with the use of arsenic-containing mixtures against the Colorado potato beetle. Crude chemicals were used for insect control long before this however. Such uses were local and sporadic and the concoctions were often applied in desperation. The major insecticidal use of arsenic in insect control was begun as the sulfide in the late 1500's. Subsequent but still early uses of insecticides consisted largely of arsenical baits for ants, grasshoppers and snails, tobacco plant preparations for aphid and lace bug control, powdered pyrethrum flowers for household insects and sulfur as a dust or fumigant for preservation of stored products.

Early modern insecticides were largely inorganic in nature and contained compounds of antimony, arsenic, mercury, selenium, sulfur, thallium and zinc as active ingredients. These compounds are effective insecticides with long residual action. They affect chewing insects only but may also accumulate in soils to the point where they become toxic to plants.

Contact insecticides date back into ancient Chinese history when certain plant extracts were used. About 300 years ago crude tobacco preparations were used for control of a lace bug on pear trees in France. The active component in these preparations was nicotine which is quite effective and is still widely used as the active ingredient in certain commercial preparations.

Fumigants to rid homes and commodities of annoying pests were known to ancients. Homer in the **Odyssey** mentions the use of sulfur fumes. Hippocrates refers to the use of fumigation by burning various gums and resins.

Modern insecticide use did not flourish until the late 1930's and early 1940's. The Second World War stimulated research on an unprecedented scale and led to a new category of pesticides, the synthetic organic compounds. DDT was introduced in about 1942 and was used with spectacular success against fleas, flies, lice, mosquitos and ticks. The U.S. Army was the major user in its fight to protect the soldier from the ravages of malaria, typhus and other insect-borne diseases. This compound was first developed by Othmar Zeidler, a young chemistry student at Strasbourg, Germany in 1874. However, its insecticidal qualities remained unknown for about sixty years. Then in 1934, Dr. Paul Müller, who was unaware of the earlier work of Zeidler, synthesized DDT in Switzerland and discovered its potential as an insecticide. Its first major use saved the potato crop of Switzerland from the Colorado potato beetle.

Organophosphorus compounds were introduced into world-wide use in 1946. These are highly effective chemicals with short residual activity which are used extensively today.

Despite the widespread acceptance and use of modern insecticides, there are three factors which may actually accentuate the insect problem. These are as follows:

1. Insect introductions through travel and commerce.
2. Upsets of balances of nature.
3. Development of insect resistance to many insecticides.

Economic Value

History abounds with accounts of sufferings and deprivations visited upon human populations by competing hordes of pests. Present living standards and practices dictate that many forms of pesticides must be used in the control of pests. Benefits to man fall generally into four categories.

1. **Preservation of materials.** The use of mothballs to protect woolen materials from damage has been a common practice. The use of such chemicals may have decreased however with the move toward synthetics. Many products available to the consumer contains materials that minimize the damage inflicted by various organisms. Housepaints, for example, now usually contains an anti-fungal component to control the growth of mold. Termites annually cost homeowners many dollars in wood damage. Chemicals are used extensively to control these pests.

2. **Control of nuisance-type insects.** Everyone has probably at one time or another purchased an aerosol can of insect repellent that allows us to enjoy a picnic without contending with annoying flies and mosquitos. Many insects do not endanger our health or compete for food directly but simply become unpleasant companions in our leisure pursuits.

3. **Agricultural uses.** Man has competed for centuries with insects and weeds in his effort to produce food for hungry mouths and empty stomachs. He purposefully contaminates his environment with pesticides to tilt the cost-benefit ratio in favor of the farmer and ultimately the consumer of agricultural products. They are a major reason why the U.S. farmer feeds and clothes 46 persons today. This is compared with 25 persons in 1960 and only 4 persons in 1850. Pesticides often represent the slender margin between economic profit and economic loss.

Modern agricultural technology depends upon the use of a variety of pesticides for treatment of soil and seeds, weed control, protection of crops from diseases and insects and post-harvest preservation of agricultural products.

4. **Control of insect disease vectors.** The use of pesticides has dramatically reduced sickness and death due to disease-carrying insects. Humans are susceptible to a wide variety of diseases spread by insects and have suffered incredibly over the centuries. The use of pesticides is one of several reasons why the death rate world-wide had dropped dramatically. A partial listing of arthropod-borne diseases is given in Table 1.

Chemicals for Pest Control

Chemicals that are used for the control of pests vary widely as to type and origin. They may be categorized by the type of pest controlled, for example, fungicides, herbicides, insecticides, rodenticides, etc. Another listing categorizes them as to origin or chemical structure.

Table 1. Representative list of arthropod-borne diseases.

Disease	Vector	Animal Affected
African sleeping sickness	Tsetse flies	Man, domestic animals
Anthrax	Horse flies	All mammals
Bubonic plague	A rat flea	Man, rodents
Epidemic typhus	The human louse	Man
Filariasis	Several mosquitos	Man
Malaria	**Anopheles** mosquito	Man, birds
Q fever	Ticks	Man
Relapsing fevers	Several ticks	Man, rodents, fowl
Rocky Mountain spotted fever	Two ticks	Man, rodents
Yellow fever	Several mosquitos	Man, many animals
Encephalitides	Several mosquitos	Man, horse, bird

1. **Pesticides of Natural Origin.** The use of tobacco as an insecticide dates back several centuries. The active component is nicotine which affects the nervous system of insects. Another natural chemical is rotenone, a compound found in the roots of certain legumes. They both have low mammalian toxicity and are still used to some extent in home gardens and powders for keeping small animals free of fleas and other ectoparasites.

Ryania is a mixture of substances from the stems and roots of **Ryania speciosa**, a shrub of tropical South America. It is highly toxic to some insects, particularly caterpillars and has been used successfully for the control of the European corn borer and codling moth.

Extracts of the dried flowers of certain chrysanthemum plants contain pyrethrum which has insecticidal qualities. This was well known in Persia and the Caucasus in the middle 19th century. Many of the present commercial pesticides contain pyrethrum as the active component.

2. **Inorganic compounds.** The first synthetic insecticides were inorganic. One of the first to be used successfully was Paris green in 1867 for the control of the Colorado potato beetle. This is a copper and arsenic compound which is generally toxic to leaf-eating insects. Lead arsenate is highly effective but because of its toxicity to humans, it has never been popular among safety authorities. Sodium fluoride and related compounds are particularly effective against gregarious crawling insects.

3. **Chlorinated hydrocarbons.** The most notable chemical in this category is DDT. These compounds are characterized by their high toxicity and long residual action. Most of the attention surrounding the pesticide controversy has centered upon chemicals in this category. Others in this group include methoxychlor, lindane, chlordane, heptachlor, dieldrin, endrin and aldrin.

4. **Organophosphates.** Compounds of this category tend to be extremely toxic to a wide range of organisms, including humans. They do, however, break down rapidly in the environment and hence have little residual action. All of these compounds inhibit certain enzymes in the living organism, particularly cholinesterase which breaks down acetylcholine, the chemical responsible for the transmission of the impulse from the nerve to the muscle. In the absence of cholinesterase, the acetylcholine accumulates and interferes with the coordination of muscular response. Such interference in the muscles of vital organs produces convulsions and eventually death. Members of this group include parathion, malathion, diazinon and others. Parathion has probably caused more deaths than all other modern pesticides. Organophosphates are absorbed through the skin as well as through the respiratory and gastrointestinal tracts.

5. **Carbamates.** This is a group of chemicals which has been widely advertised as being relatively safe and effective. It includes Sevin and Zectran which are broad spectrum, general purpose insecticides.

6. **Herbicides.** The parent compound for many of the chemicals in this group is phenoxyacetic acid. Certain of these compounds have growth-regulating properties and can be used in selective weed control. The best known of these is 2,4-D and 2,4,5-T. They are cheap and selective for broad-leaves so that cereal plants are not affected.

Many other types have been synthesized which are also highly effective and selective.

7. **Others.** A host of other chemicals have been discovered which are useful in the control of fungi, rodents, plant parasites, and mites and ticks.

Presence in the Environment

Since the time that pesticides have been extensively used, an enormous amount has been introduced into the world's ecosystem. It should be emphasized that for the most part, these chemicals are new to the biosphere and hence there has been little time for natural systems to develop degradative enzymes that remove them. Therefore, many of these chemicals tend to remain for many years before the levels return to pre-application values. The accompanying figure (Fig. 1) illustrates the total sales of fungicides, herbicides and instecticides in the United States for the period 1962-69. The U.S. Department of Agriculture in 1966 estimated that of 350 million acres of land cultivated, herbicides were applied to 27%, insecticides to 12% and fungicides to 2.6%. However the rate of application is much higher in intensively farmed areas.

The use of pesticides has become virtually indispensable to modern agriculture. Yet for the majority of the chemicals, we only have superficial knowledge concerning the effects of long-term use in the environment. A veritable mountain of data has been accumulated concerning the contamination of animals, crops, soil, foods and even humans. In relation to the total problem however, inquiry needs to

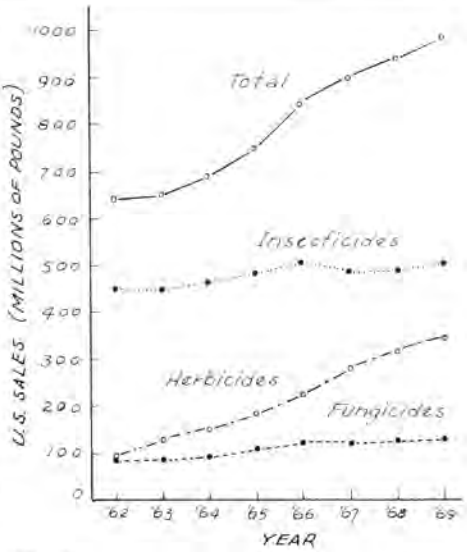

Fig. 1.

Sales of pesticides in the United States, 1962-69. (Modified from: Metcalf, Robert L. 1971. Pesticides. Journal of Soil & Water Conservation. March-April, pp. 57-60.).

be made concerning rates of accumulation in soils and water, effects on soil microflora, the effects upon food chains and the possibility that some of the compounds may in fact be mutagenic, teratogenic or carcinogenic in humans.

Since most of the controversy concerning pesticides has been centered around the chlorinated hydrocarbons and in particular DDT, much of the remaining discussion will deal with this group of chemicals.

Residues of these chemicals have sometimes been found in organisms, soil, and even ice thousands of miles from the point of application. A basic comprehension of the physical properties of these chemicals (chlorinated hydrocarbons or organochlorines) will enable the reader to better understand some of the effects upon the ecosystem.

1. These compounds are said to be persistent in that they are stable and remain in toxic form long enough to contaminate non-target organisms, often many miles from the site of use.

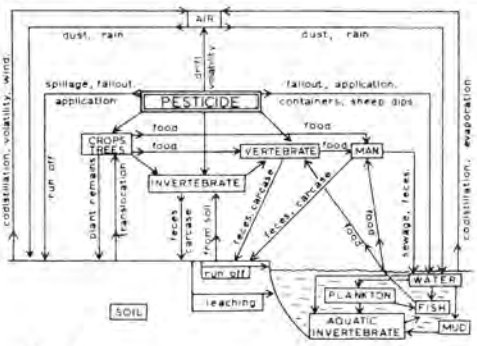

Fig. 2.

Pesticide cycling in the environment. (From: Edwards, Clive A. 1970. Persistent Pesticides in the Environment. The Chemical Rubber Co.).

2. These compounds are mobile. They may form suspensions in air and water or adsorb to particulate matter present in air and water. Furthermore the vapor pressure is such that they codistil with water and may escape from wet soil through evaporation of moisture. They may thus circle the globe and come down in the precipitation elsewhere.

3. They have a broad spectrum of biological activity. The effects may extend to many non-target organisms.

4. These chemicals have a low solubility in water and high solubility in lipid material. Biological membranes contain large quantities of lipid compounds. Pesticides are thus easily taken up by living organisms.

The cycling of pesticides in the environment is illustrated in figure 2. The movement through the various compartments of the environment precludes their remaining a local problem. Tests in Maine and New Brunswick have shown that DDT sprayed from airplanes to control the spruce budworm in forests did not all necessarily end up at the site of application. Even in the open, away from trees, only about one-half of the DDT reached the ground. The rest was presumably dispersed as crystals in the air.

One of the greatest concerns of biologists is the effects of these persistent pesticides as they accumulate in greater amounts at the higher trophic levels in food chains. Energy flow in an ecosystem is illustrated by the food web shown in figure 3. Analysis by scientists in New York have shown the complexity of this particular ecosystem. It is evident that most of the consumers feed on several different organisms. In other words, the food chains are interlinked. Complexity is believed to be in part responsible for the stability of an ecosystem. The more crosslinks there are, the more chances there are for the ecosystem to compensate for stresses imposed upon it. The cross-connecting links also mean that any toxic substances entering the web is distributed across it. The accumulation at higher trophic levels in a food chain as shown by the numbers is referred to as biological magnification. Figure 4 illustrates how this occurs. As biomass or living material is transferred from one level to another usually more than half is lost in respiration or by excretion. The remainder forms new biomass in the next trophic level. Losses of DDT residues in this

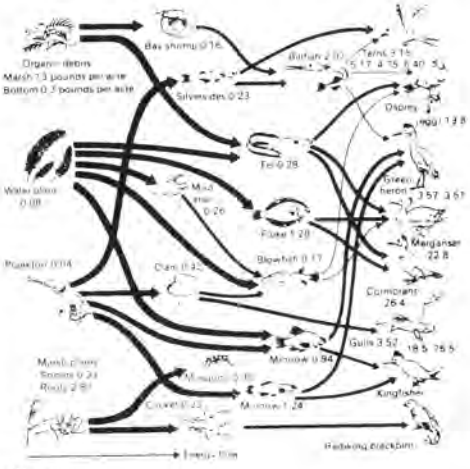

Fig. 3.

Food web in a Long Island estuary. Numbers indicate parts per million of DDT and its derivatives on a wet weight, whole-body basis. Arrows represent energy flow. (From: Woodwell, George M. 1967. Toxic Substances and Ecological Cycles. Scientific American. March, p. 24).

case, are not proportional to the loss of biomass. For this reason higher concentrations are found in the carnivores.

Other ecosystems have been analyzed and similar results are found. Lake Michigan, for instance, contains DDT in the water at about 2 ppt (parts per trillion). Bottom samples, however, contain an average of 0.014 ppm (parts per million), amphipods, 0.41 ppm; fish 3-6 ppm; and herring gulls at top of the food chain, as much as 99 ppm. This represents an approximate five million-fold concentration from the water.

The environmental toxicity of mercury is well documented. The initial evidence for this came from the tragedy at Minamata Bay, Japan. Fish and other marine orgnisms represents a large portion of the diet for the inhabitants of this area. In the period 1953-60, 111 persons were reportedly poisoned with 44 deaths after eating fish loaded with mercury discharged by industries on the shores of the bay. Mercury poisoning is now often referred to as Minamata disease. In 1970, it was found that there was considerable mercury pollution in Lake Erie. Fish from this lake contained mercury at levels up to 3.5 ppm, well in excess of Federal Drug Administration safety-standards. Wild game in the western part of the United States and Canada have been shown to be contaminated with mercury. Wild game in Sweden presented the first warning that industrial discharges of mercury was contaminating their envirnoment. Prompt action by the Swedish government brought restrictions on the uses of mercurials.

Microbial metabolism of mercury yields methyl mercury which is volatile and lipid soluble. This provides a mechanism for the circulation in the environment and accumulation by living organisms.

Analysis of various organisms shows that there is widespread contamination by DDT and other persistent pesticides. Data such as this correlates closely with the increased usage over the years. Furthermore, organisms far from areas of usage contain appreciable quantities indicating again the transport through the biosphere. Innumerable studies show that this contamination affects virtually

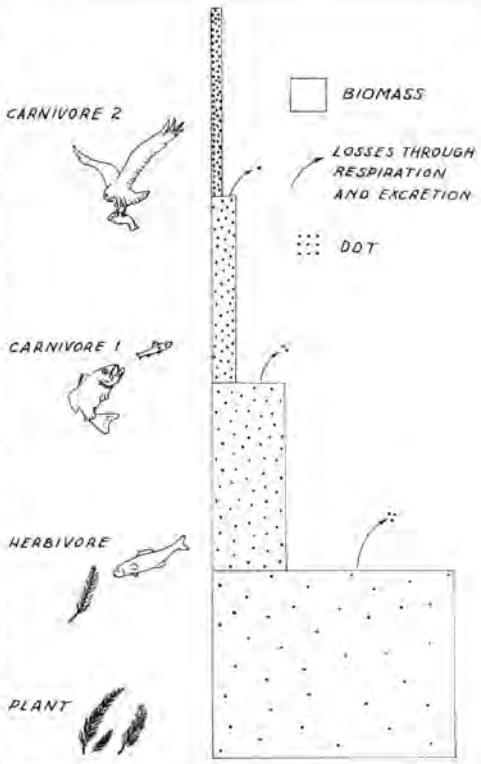

Fig. 4.

Transport and concentration of DDT along a simple food chain to illustrate concept of "biological magnification." (From: Woodwell, George M. 1967. Toxic Substances and Ecological Cycles. Scientific American. March, p. 24).

all organisms including humans (Table 2). It has been shown that pesticides in humans crosses the placental barrier and thus the fetus becomes exposed as well. Human milk in certain areas of the world reportedly contains pesticide residues and would be declared unfit for human consumption if it were cows' milk.

A great deal of concern has been expressed for particularly the birds of prey that occupy the top of food chains. The greatest danger for these animals is that chlorinated hydrocarbons alters their metabolism in such a way that reduces the amount of calcium in the shell of

Table 2. Concentration of DDT residues and its derivatives in various living organisms. (From: Woodwell, George M. 1967. Toxic Substances and Ecological Cycles. Scientific American. March, p. 24).

Location	Organism	Tissue	Concentration (parts per million)
U.S. (average)	Man	Fat	11
Alaska (Eskimo)			2.8
England			2.2
West Germany			2.3
France			5.2
Canada			5.3
Hungary			12.4
Israel			19.2
India			12.8-31.0
U.S.			
California	Plankton		5.3
California	Bass	Edible Flesh	4-138
California	Grebes	Visceral Fat	Up to 1,600
Montana	Robin	Whole Body	6.8-13.9
Wisconsin	Crustacea		0.41
Wisconsin	Chub	Whole Body	4.52
Wisconsin	Gull	Brain	20.8
Missouri	Bald Eagle	Eggs	1.1-5.6
Connecticut	Osprey	Eggs	6.5
Florida	Dolphin	Blubber	About 220
Canada	Woodcock	Whole Body	1.7
Antarctica	Penguin	Fat	0.015-0.18
Antarctica	Seal	Fat	0.042-0.12
Scotland	Eagle	Eggs	1.18
New Zealand	Trout	Whole Body	0.6-0.8

the egg. With the reduction of this vital element, the eggshell is thinner and more fragile. Breakage of eggs during incubation is extensive and reproductive success is thus decreased. There have been dramatic decreases in the hatches of many birds and hence a population decrease results.

One of the things to be considered when a pesticide is to be used is the effect it might have upon the balance that exists between different organisms of the habitat. A reduction in population or activity of beneficial predators can lead to an enormous increase in a pest problem. Such an upset in the equilibrium may occur when the beneficial predators are more affected by the pesticide than the pests themselves. Such a situation is illustrated in figure 5. This represents a test plot containing predatory mites and their prey, the springtail. Organophosphorus insecticide was used in the test. The predatory species suffered immediately while the springtail population was scarcely affected. In fact, there was an increase in numbers due to the reduction of predators.

A computer model of DDT flow in the environment shows that the problem may exist

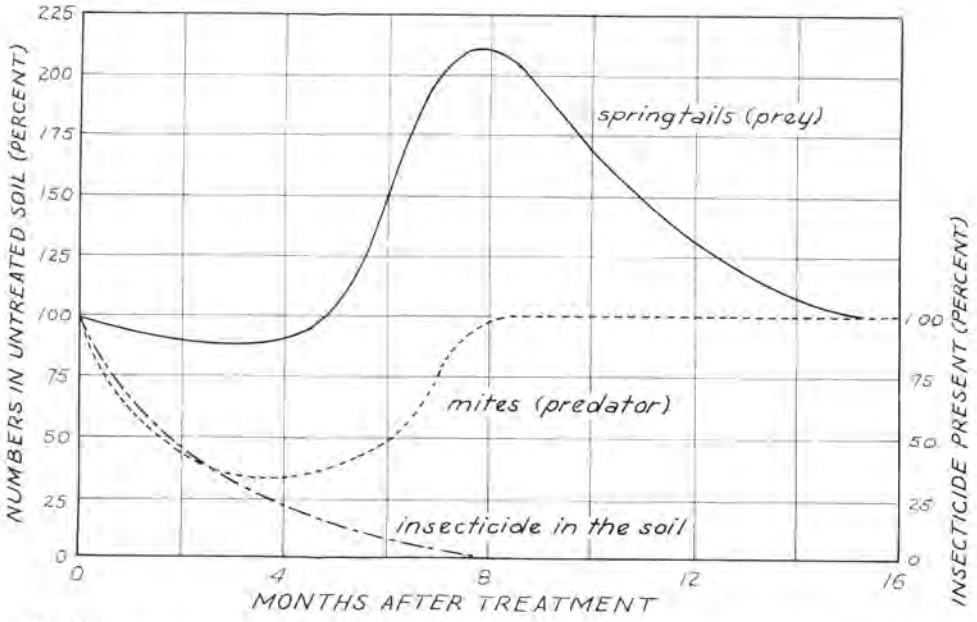

Fig. 5.

Effect of organophosphate insecticide on predatory-prey balance in a test plot. (From: Edwards, Clive A. 1969. Soil Pollutants and Soil Animals. Scientific American. April, p. 88).

even after the usage has been halted (Fig. 6). The graph illustrates what would happen if in 1970 the world DDT application reached its peak and thereafter decreased until finally it reached zero usage in the year 2000. Because of the inherent delays in the system, made possible by the persistence of the chemical and the flow through different compartments of the environment, the level in fish continues to rise for approximately 11 years after the application of DDT has begun to decline. Furthermore, the level in fish does not reach 1970 levels until more than two decades later.

It should be noted here that the United States has banned the use of DDT effective December 31, 1972. Public health and quarantine considerations, a few minor crop uses, and export are exceptions.

Ecosystem modeling of DDT movement in the biosphere by scientists at Brookhaven National Laboratory in New York suggest that the residues flow from the land through the atmosphere into the oceans and finally into the oceanic abyss. The model further suggests that the maximum concentration in the air may have occurred in 1966 and in the mixed layers of the ocean in 1971.

Physiological and Biochemical Effects

It has been said that people understand acute poisoning but they find subtle physiological changes difficult to grasp. A great deal is known about the accumulation, concentration and toxicity of pesticides but relatively little is known concerning its metabolic effects. Probably more is known about the eggshell-thinning phenomenon in birds than any of the other biochemical effects. The chlorinated hydrocarbons induce a thinning of the eggshell in a variety of birds including the brown pelican, bald and golden eagle, black ducks, mallard, Alaskan falcons and hawks, Japanese quail, ringdoves, Western grebe, osprey, peregrine falcon, sparrow hawk, Bermuda petrel and Herring gulls. On the other hand, chlorinated hydrocarbons do not seem to affect eggshell thickness in the domestic chicken. Related chemicals, the polychlorinated

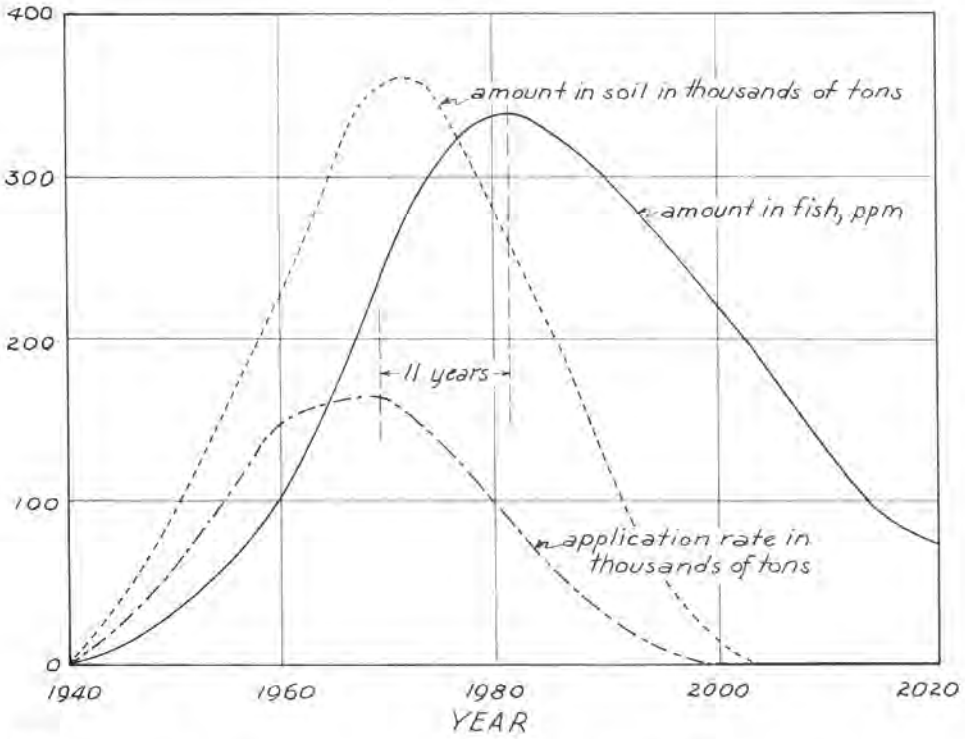

Fig. 6.

Computer calculation of DDT in the environment. DDT application rate is historically correct up to 1970. The assumption was that the usage would then begin to decline. (From: Meadows, D. H., et al. 1972. The Limits to Growth. Universe Books, New York).

biphenyls (PCB's) used in industry, do adversely affect hatchability of eggs in the domestic chicken. Scientists have shown that the chlorinated hydrocarbon pesticides may affect reproduction in at least two ways. Firstly, they induce the liver to produce steroid hydroxylase enzymes which alters the structure of steroid reproductive hormones. The hormones become more easily excreted, blood levels are thus lowered and reproductive behavior, such as delayed breeding, is affected. Also, these chemicals appear to inhibit the enzyme carbonic anhydrase which makes the supply of calcium carried in the bloodstream available to the oviduct where the eggshell is formed. Without the supply of calcium, a thinner eggshell results which is more fragile and thus susceptible to breakage.

Canadian biologists have shown that trout when exposed to DDT (20 ppb in the water) show inability to learn to avoid electric shock. Rats fed DDT following a learning experience took longer to relearn the maze than did animals not so exposed. Estrogenic activity of DDT has been shown in rats and monkeys. DDT also induces steroid hydroxylating enzymes in the liver of the rat. The ultrastructure of liver cells in such animals show morphological changes that may be associated with altered function. Research in the cellular physiology laboratory at KSTC shows that DDT markedly affects the respiratory capacity of mouse and chicken liver mitochondria. In this case it appears that the mitochondrial membrane may be altered to produce this inhibitory effect.

There are some life processes that do not appear to be affected by these chemicals. DDT had no apparent effect upon aggressiveness in laboratory mice. In another study, DDT had no apparent adverse effects upon reproduction and lactation in the rat. A 15 week period of feeding DDT to turkeys did not cause alterations of blood pressure, gross structure of body tissues, histology of internal organs, or plasma levels of calcium, cholesterol and protein.

Human organophosphate exposure produced disorientation in space and time, a sense of depersonalization, and hallucinations. Heavy exposures produce convulsions. Electroencephalographic tracings (EEG's) implied abnormal activity in the temporal cortex of the brain.

The herbicide 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) has been shown to be teratogenic, that is, it induces fetal malformations in the golden hamster. The effects were less severe for the related herbicide, 2,4-D. Both of these herbicides have been used as defoliants during the Vietnam War. The United States government in 1970 imposed curbs on the usage of 2,4,5-T both for domestic purposes and as a defoliant in the combat zone.

The significance of pesticide contamination to human health is difficult to assess. For many pesticides such as parathion and dieldrin, the effects are rapid and distressingly final. However experiments have shown that chronic DDT intakes amounting to 1, 20, and 200 times the intake of the general population had no deleterious effects as shown by careful clinical follow-up and laboratory testing. Therefore it seems that any effects which might appear will be due to more subtle changes over a longer period of time.

New Approaches to Pest Control

Alternative methods of pest control are in many stages of development and several require more basic research before their potential can be evaluated.

1. **Resistant plants.** The outstanding example is the development of varieties of wheat resistant to the Hessian fly. Others now being used or developed include alfalfa for the spotted alfalfa aphid, leafhopper, and alfalfa weevil. Corn varieties have been released which are resistant to European corn borer, corn earworm, rice weevil and corn rootworm. The development, however, may take 10 to 15 years and in some areas such as cotton, progress has been particularly slow.

2. **Predators and parasites.** The first successful control program involved the importation of a ladybug, **Rodolia cardinalis**, from Australia for the control of cottony cushion scale, a pest of citrus in California. Ladybug beetles are a very beneficial group of insects and feed on aphids, scale insects and many other injurious species. The USDA feels that one of the most promising areas is the mass rearing of the lacewing larvae for control of bollworm. Praying mantids are completely predatory and feed on scale insects, aphids, various flying insects and caterpillars. The praying mantid will not attack the ladybug because of a scent given off by this beetle.

Parasites of injurious insects seem to have a great deal of potential for pest control. Parasites for the vector of Dutch elm disease and for the spotted alfalfa aphid have been discovered.

3. **Bacteria and viruses.** An insect pathogen which shows promise as a control agent is **Bacillus thuringiensis**. Perhaps even more promising are the toxins produced by this species. They appear to have a broad spectrum of activity but with little effect on higher animals.

Viruses have also been isolated which show promise for insect control. For example, a virus that is effective against the cotton bollworm (or corn earworm) is being developed.

4. **Sex attractants.** An approach that is receiving much emphasis is the development and use of insect attractants. These are natural compounds of insects which may be used to advantage such as attracting pests into traps. They may then be destroyed by other methods. Another use might be the spreading of the chemical which inevitably confuses the insect in its mating behavior. Potent attractants have been developed for the Mediterranean fruit fly, the melon fly and the gypsy moth.

5. **Development hormones.** Many scientists think that insect development hormones such as juvenile hormone, have potential in insect control. When present at certain stages of development they cause the formation of abnormal insects that cannot develop or reproduce.

6. **The sterile male technique.** The release of sterile male insects, made sterile either by chemicals or gamma radiation, has been a successful means of eliminating certain pest populations. Male insects are sterilized in such a way that their normal mating habits are not altered. Female mates of these sterilized males lay infertile eggs so offspring do not develop. This method has been particularly successful in controlling the screwworm fly population in the southern United States. The annual cost of this program is one-fifteenth of the estimated annual losses due to control costs and livestock damage before the insect was eliminated.

Future of Pesticides

Nonchemical methods of control are not expected to supplant entirely the use of chemical pesticides in the foreseeable future. It is imperative however that some of the practices be changed that have contributed to the erosion of environmental quality and public confidence. Dr. Robert L. Metcalf, Professor of Zoology at the University of Illinois, suggests that the sale be by prescription and the use supervised by trained plant pest control specialists or phytopharmacists. Professor Metcalf further suggests that successful pest management requires:

a. coordination of programs by highly trained specialists;

b. replacement of "routine" applications by applications based on an assessment of the problem;

c. recognition that some crops can tolerate substantial pest damage without economic loss;

d. abandonment of unnecessary pesticide treatments;

e. changes in agricultural practices to utilize selected crop varieties, cultivation practices, planting patterns, crop rotation, etc., to minimize the pest problem.

Suggestions for the Home Gardener

No panaceas are offered in this section which will allow the gardener to completely discontinue the use of pesticides. Most of the alternatives to chemical control discussed in a previous section are not practical for the backyard garden. As a matter of fact, it is my opinion that pesticides are still needed for use in the garden and on ornamental shrubs. However, ecologically oriented practices can minimize their use.

Use gardening practices that aid beneficial species. Providing hiding sites such as lumber, stones and rank vegetation encourage these natural enemies to take up residence. Flowering weeds should be encouraged where they aren't overly competitive. Many beneficial species need a continual pollen source for protein from which to develop their eggs. Try collecting or buying beneficial species and releasing them in your garden. Green lacewings, praying mantids, ladybugs and others are all voracious predators.

Insect attack can sometimes be avoided by planting as early or late as possible. If the plant does not fit into the life cycle of the pest, a build-up of the population can be minimized. Furthermore, maintain as much diversity as possible. Monoculture (single-crop planting) usually encourages pest build-up. Avoid planting any crop in blocks. The following plants interspersed among the rest generally help repel harmful insects—mint, onion family, nasturtium and strong-smelling marigolds. Provide a water supply for birds and insects and nest boxes for insectivorous birds. Maintain organically rich soil.

If it becomes necessary to use pesticides, they should be used with extreme care. A discussion concerning some of the safer insecticides follows. A fuller explanation is given in the booklet **Pesticides: A Guide to Safe Garden Use** by Robert Dingwall.

1. **Dormant oil spray.** A three percent miscible oil dormant spray is effective against a variety of insect pests. Sucking and chewing insects such as aphids, red spiders, thrips, mealy bugs and others can be controlled. Eggs of codling moth, oriental fruit moth, leaf rollers and cankerworms can be destroyed by this method.

2. **Pyrethrum.** This compound is effective against a wide variety of insects and is probably the least toxic to man and higher animals.

3. **Rotenone.** This compound can be used safely on all crops and ornamentals. It has a very low toxicity to man and animals but the period of protection is short.

4. **Ryania.** This powder has little effect on warm-blooded animals but is useful in controlling cotton bollworm, codling moth, corn borers and other insects.

5. If stronger chemicals must be used, the following can be used with caution.

a. **Black Leaf 40** is a nicotine compound that is effective for sucking insects.

b. **Powdered sulfur** can be used for insect and fungus control.

c. **Sevin** is a carbamate with a short residual effect.

d. **Malathion** is the least toxic of the organophosphates to mammals.

e. **Methoxychlor** is the least toxic of the chlorinated hydrocarbons but is still quite potent and persistent.

Product List (Taken from The Living Garden, An Environmental Calendar, 1973)

1. **Oil Sprays**

dormant oil—such as Scalecide

summer oil—such as Ortho Volck, Sunoco Summer Oil

2. **Biological Controls**

Milky spore disease—a specific control for Japanese beetle grubs, available as "Doom" (Fairfax Biological Control Laboratory, Clinton Corners, N.Y. 12514). Preferably apply after ground thaws in early spring.

Bacillus thuringiensis—a bacterium which attacks only lepidopteran larvae, such as gypsy moth and diamondback moth larvae, tent caterpillars, tobacco bud and hornworms. Apply to specific pest caterpillars as they emerge. "Thuricide" (International Minerals & Chemical Corp., P.O. Box 192, Libertyville, Ill. 60048) or "Biotrol" (Thompson-Hayward Chemical Co., Box 2383, Kansas City, Kans. 66110).

Some beneficial predatory insects can be bought for release in the garden. They cannot be precisely managed, but the following will help control pests:

ladybugs—feed on aphids, scale insects, mealybugs, bollworms, leafworms, leafhoppers, corn earworms, etc.

praying mantids—feed on scale insects, aphids, caterpillars, etc.

Trichogramma—microscopic insect, harmless to humans, which lays its eggs inside those of butterflies and moths and destroys them. Repeated liberations can control codling moth, Oriental fruit moth and imported cabbageworm. (All three are available from Mincemoyer Nursery, County Line Road, Jackson, N.J. 08527; ladybugs and praying mantids from Montgomery Ward Farm Catalogue or Bio-Control, Rt. 2, Box 2397, Auburn, Calif. 95603; Trichogramma and praying mantids from Gothard, Inc., P.O. 370, Canutillo, Tex. 79835.)

3. **Botanical Sprays and Dusts**

pyrethrum—such as D-con House and Garden Spray, Raid House and Garden Spray, Ortho Home and Garden Insect Spray, Aerosect. Certain additives in pyrethrum sprays have possible hazardous side effects; avoid repeated exposure.

rotenone—available as spray or dust, such as Ortho Rotenone Spray and Dust; toxic to swine, very toxic to fish.

rotenone, ryania, pyrethrum—such as B.D. Tree Spray for orchards (Peter Escher, Threefold Farm, Spring Valley, N.Y. 10977; Tri-Excel DS, The Natural Development Co., Bainbridge, Pa. 17502).

nicotine sulfate—Black Leaf 40. Use with extreme caution, very toxic to humans; but like other botanicals, it breaks down into harmless compounds soon after application.

4. **Safer Fungicides**

Bordeaux mixture—copper sulfate and lime; can be toxic to fish and other aquatic organisms.

sulfur—may burn plants on hot, sunny days; apply in evening.

NOTE: Apply dusts and sprays with care and on a limited and identified target. READ AND FOLLOW DIRECTIONS. Apply when temperature is under 85 degrees or in evening to avoid damaging plants.

5. Homemade Sprays for Aphid Control

onion spray—grind or chop green onions, add equal amount of water, strain.

garlic spray—mix one part of garlic extract or powder with four parts water.

pepper spray—grind several capsules of hot pepper, add an equal amount of water, strain.

6. Barrier Bands

"Tree Tanglefoot" (The Tanglefoot Co., 314 Straight Avenue, S.W., Grand Rapids, Mich. 49500). Available as spray or wrapping material. Keeps webworm, gypsy moth and other caterpillars from reaching tree foliage.

7. Other Sources

W. Atlee Burpee Co., Box 6929, Philadelphia, Pa. 19132: compost maker, herb seeds, rotenone, "Tree Tanglefoot."

Geo. W. Park Seed Co., Greenwood, S.C. 29646: cover crop and herb seeds, rotenone, soil test kits.

Wayside Gardens, Mentor, Ohio 44060: Wayside Organic Plant Food, Sea-Born (dehydrated seaweed), Fertosan (organic compost maker).

Cosmic View, Inc., 4822 MacArthur Blvd. N.E., Washington, D.C. 20007: Cosmic Dust organic fertilizer.

8. Birdhouses

Audubon Bookshop, 1621 Wisconsin Ave., N.W., Washington, D.C. 20007: bluebird and other houses and building plans.

Trio Mfg. Co., Griggsville, Ill. 62340: martin houses—aluminum. Purple martins eat flies and mosquitos.

SUGGESTED REFERENCES

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Edwards, Clive A. 1969. **Soil Pollutants and Soil Animals.** Scientific American, April, pp. 88-99.

Edwards, Clive A. 1970. **Persistent Pesticides in the Environment.** CRC Press, 18091 Cranwood Parkway, Cleveland, Ohio 44128.

Graham, Frank Jr. 1970. **Since Silent Spring.** Houghton-Mifflin, Boston, Mass.

Metcalf, Robert L. 1971. **Pesticides.** Journal of Soil and Water Conservation, March-April, pp. 57-60.

Moats, Sheila A. and William A. Moats. 1970. **Toward Safer Use of Pesticides.** Bioscience April 15, pp. 459-463.

Peakall, David B. 1970. **Pesticides and the Reproduction of Birds.** Scientific American, April, pp. 72-77.

Rudd, Robert L. 1964. **Pesticides and the Living Landscape.** University of Wisconsin Press, Madison.

Woodwell, George M. 1967. **Toxic Substances and Ecological Cycles.** Scientific American, March, pp. 24-31.

The following are available at reasonable cost

Dingwall, Robert J. **Pesticides: A Guide to Safe Garden Use.** Missouri Botanical Garden, 2315 Tower Grove Ave., St. Louis, Mo. 63110, 75¢. **The Living Garden, An Environmental Calendar, 1973.** Available from Concern/ANS, 2233 Wisconsin Ave., N.W., Washington, D.C. 20007. $3.00 each or $2.50 each for orders of ten or more.

The Kansas School Naturalist
The Kansas State Teachers College
1200 Commercial Street
Emporia, Kansas 66801

Bi. 536B. Workshop in Environmental Biology, 3 hrs. credit. Topeka area (Perry Reservoir), June 4-June 22. Persons enrolled will commute to the lakeside site for instructions in practical ecological concepts and techniques of environmental measurements. Particularly applicable for teachers. Request information from Dr. Robert Boles, Biology Department, KSTC.

Bi. 430. Workshop in Conservation, 3 hrs. credit. June 11-June 29. Seminars, lectures, discussions and field trips dealing with problems and status of natural resources. Especially desirable for teachers. Request information from Dr. Robert Parenti, Biology Department, KSTC.

High school seniors and students graduating from Junior Colleges who are interested in some field of science or in such fields as nursing, microbiology, and medically related areas are invited to visit the KSTC Biology and Physical Science Departments to look over the facilities, and to discuss the various programs with members of the staff. Science instructors and counselors are invited to bring groups of students with interests in science, and who might wish to take further training in this field. We suggest that you write or call in advance, so that someone may be provided to show you about the Science Department and introduce you to the faculty.

Entered as Second
Class Mail and
Second Class
Postage Paid
at Emporia, Kansas

This is another good book to introduce the reader to the interesting subject of "urban natural history." (See my review in last winter's issue of this journal, of Mary Adrian's *Secret Neighbors.*) It deals mainly with plants found in New York City, but could be read with interest with reference to almost any large American city. A list of wild plants to be found in Manhattan is supplemented by similar lists for Denver and Los Angeles. These lists, the author states, ". . . do not pretend to be definitive, but they offer a fair sampling of inner-city weeds."

I would rate this book high, both as a picture book and interesting reading. The fine illustrations, in pleasing and realistic color, accompany a text that is clear, unsentimental and readable. The Foreword acknowledges the help the author has received from a number of well-qualified botanists, which is reflected in the scientific accuracy of the book. In part the text is based on seasonal changes (chapters on April, May, June, Summer and Autumn). These times are correlated with the major plant parts: April, roots; May, leaves; June, flowers; Autumn, seeds. The Summer chapter serves as a good introduction to the nature of plant families, based on two families, the grasses and the composites, that are of great general importance as well as prominence in the flora of cities. The description of the grass family calls the reader's attention to the beauty, not to be appreciated without the aid of a magnifying lens, of the minute flowers of grasses and other wind-pollinated plants. The discussion of leaves includes an adequate explanation of the process of photosynthesis, in simple but accurate terms. Other chapters deal with the nature of weeds and their significance to man.

There is an adequate Index, in which italicized page numbers refer to illustrations. One might regret the omission, however, of a bibliography of sources of additional information about this fascinating subject. The publisher does not indicate an age level for which this book is appropriate; and quite properly so, for it is a book that transcends age, and can be read with pleasure and profit by readers of many ages.

° ° °

Shakespeare's Flowers by Jessica Kerr. Ill. by Anne Ophelia Dowden. Thomas Y. Crowell Company, New York, 1969. 90 pp. $5.95.

If you enjoy both Shakespeare and flowering plants, and have asked such questions as "What in the world is a *gillyvor*? – then surely you will enjoy this little book. You can enjoy it in several ways. It is a pleasure simply to thumb through it and admire the illustrations, which are well drawn and printed in lively colors. But this is more than a picture book: the text is well written and interesting.

From it you can learn that the *gillyvor* of Shakespeare is a first cousin of the familiar carnation. That these flowers, also called *pinks*, are the source of the common expression, of being in the "pink of condition." (Other such floral derivations come to mind: "rue the day," "primrose path.") Shakespeare's *darnel* turns out to be the rye grass (*Lolium*); it is probably the same plant as the *tares* of the New Testament. The point of all this is that there is more in a name than the familiar quotation from Shakespeare would lead us to believe.

This is a well designed book. The clear type and the generous spacing between words and lines make it easy on tired eyes. I did not find a single misprint – an unusual experience in these times. There is an adequate Index of the plants dealt with; here you find the scientific names of the plants, which are not given in the text. There is also an *Index of Shakespearean Sources,* an *Index of Plays and Poems,* and a *Bibliography* of 42 items. All these features make the book handy for reference, after one's initial reading of it.

Incidentally, I like the idea of notes *About the Author* and *About the Illustrator* being incorporated into the book (last page) instead of being only on the jacket.

° ° °

The Changing World of Birds by John M. Anderson. Ill. with photographs. Holt, Rinehart and Winston, New York. 122 pp. 1973. $5.95. Ages 10-up.

In this world of constant, rapid change, we are fortunate that a competent series of books is being published on *The Changing World.*

Although this book deals with many aspects of the biology of birds, it maintains a unity through its emphasis on its main theme, expressed in the author's statement that "A sudden decline in any bird population is a strong indicator that environment is changing in a way that may be harmful to people, too."

Of the topics dealt with I found the following to be especially interesting: How agricultural methods destroy bird habitats. What pests are, and the dangers of the use of pesticides. How birds cope with the proximity of man and adapt to the environmental changes he causes. Bird migration (this account deepens the mystery of this remarkable phenomenon instead of dispelling it). The saddening story of the extinction of many bird species. These are aspects of bird biology that bird watchers will find interesting.

The forward-looking tone of the book is expressed well when the author speaks of "the task that lies ahead – that of restoring an environment in which birds can live and in which people cannot only live but have something to live for." My own concern with the way biology can enrich esthetically the world that one lives in, finds a welcome echo in his statement that "Once you have identified the bird, you will be looking with the eye of an artist and you will see a different world from that day on."

An Afterword on Bird Watching is a useful adjunct to this book. There is also a Glossary, a list of Books for Further Reading, and an adequate Index.

This book well deserves to be listed under the heading of *Good Reading.*

° ° °

The Wild Food Trailguide by Alan Hall. Ill. with drawings by Katie Matthysse. Holt, Rinehart and Winston, New York. 195 pp. 1973. $3.45.

Every year I promise myself that I'll keep up with the cultivating to keep ahead of the weeds in the vegetable garden – and every year they get ahead of me during those lush June days when weeds seem to grow exponentially. It's best to take a philosophical outlook on a problem like this – so my wife and I long ago decided that "if you can't beat 'em, eat 'em." My, what luscious Lamb's Quarters! What tender Purslane! What sweet Milkweed!

And every year the local Girl Scouts want to know what they can eat on their "survival" cookouts, and college students are curious on what's edible (or not) in my class in field natural history. In spite of all this interest, and the abundance of edible plants in the wild, handy references to the subject of wild food plants have been hard to come by. There was that delightful issue of the Cornell Rural School Leaflet written by Eva Gordon thirty years ago ("Wild Foods," March, 1943); the books by Euell Gibbons; and a variety of more or less un-handy handbooks and articles.

This book by Alan Hall admirably fills the gap. It is well-organized and well-written and illustrated. It describes seventy of our more common edible wild plants (no animals, although the title might suggest more than plants). Each species is given two pages, one with line drawings of the important features for identification and a small range map, the other with a written description of the plant, its range and natural history, and its use for food. Helpful hints on collecting and preparing are given. The author is the son of Professor Ben Hall, eminent botanist who checked the text for scientific accuracy. (Readers of NATURE STUDY have enjoyed Ben Hall's

reviews and articles for several years.)

In addition to the individual descriptions of each species, there is a section at the beginning listing various uses of wild plants and the plants most likely to fill them – under such headings as "trail nibbles," "potherbs," "salads," "flours and cereals," "jams and jellies," "coffee substitutes," "seasonings," and many more. Page references in each of these sections make this a valuable cross-reference. Another chapter lists the plants (again with page references) by basic habitat: "dry open land," "wet woods," and so forth. At the end of the book is a section on "look-alike" poisonous plants to be avoided!

Most appealing to me was the consistent use of a non-technical style and language. This book proves that botanical accuracy can be achieved without resorting to technical jargon. Any moderately-literate layman can use this book with ease. The following quote from the description of Lamb's Quarters* is typical: "The pale green leaves are 1-4 in. long and have long leafstalks. They are arranged alternately on the stems and are shaped rather like the feet of geese, being broad and somewhat triangular at the base and then narrowing toward the tip in a series of blunt, almost wavy teeth." No need for words like "rhombic-ovate," "lanceolate," "linear," "acute," "angulate-toothed" or "petiole." Even so, there is an illustrated glossary of such relatively unfamiliar (but good English) words as "grain," "fruit," "leafstalk" – words which we often use but which have rather precise botanical meanings.

The book is well-bound in paperback, and is of a size which will slip into pack or pocket – a true "trailguide" handbook. The price seems a little high (as does everything else these days), but it is a worthwhile addition to your field guide library – or to that of a friend.

J.A.G.

° ° °

Beyond The Classroom: Using the Urban Environment as an Instructional Medium, Dickey, Miriam E. and Roth, Charles E. Trial Edition, 1972. Masachusetts Audubon Society.

This forty page booklet is aimed at helping teachers develop environmental literacy in themselves and in their students. It has grown out of more than 30 years experience teaching in small cities as well as in metropolitan areas. The authors have tried to synthesize the best of the past and the most vital of the present.

They define teaching as a process that "basically facilitates the learning of students," and remind us that this process demands courage and security on the part of the teachers. The book is designed to help develop these qualities in teachers and to encourage them to go "beyond the classroom" with their classes.

One chapter gives concrete suggestions for field trip procedures in relationship to classroom learning. Another deals with America, not as a melting pot, but as "minestrone soup" and develops the idea that children – and adults – view things from the framework of their cultural backgrounds and that the recognition of these ethnic influences is essential since "if physical environment is the sole component of the study, [the study] is grossly incomplete – man must learn to understand man."

The bibliography offers a good selection of easily understood books that should help teachers increase their environmental literacy, as well as provide additional teaching suggestions and techniques.

Appendix A lists several hundred environmental concepts by subject matter areas.

Appendix B consists of charts suggesting sources of local aid and environmental information. Space is provided for teachers or teachers and pupils to fill in the addresses, telephone numbers and contact person for each potential source of help or field trip. This survey in itself should open doors to new teaching possibilities for many schools.

HELEN R. RUSSELL

*Which appears in the index only under "pigweed" – the only slip of this kind which I noted.

American Nature Study Society 1973 Book Exhibit

All books and pamphlets written, illustrated, and/or edited by ANSS members.

Betros, Harry F. **Understanding Schoolyard Ecology.** New York: Exposition Press, 1972. Adults (youth leaders and teachers), $5.50.

Bonwill, Allen and Ellen. **Outdoor Fun — Learning to Look at Our Environment.** North Haven, Connecticut: Area Cooperative Educational Services. Youth leaders and teachers, $1.00.

Brainerd, John W. **Nature Study for Conservation:** A handbook for Environmental Education. New York: Macmillan, 1971. Junior high-adult, $4.95.

Brown, Vinson et al. **Handbook of California Birds.** Healdsburg, California: Naturegraph Publishers, 1973. Adults, $5.95.

— **Wildlife and Plants of the Cascades.** 1971. Adult, $5.95.

Busch, Phyllis S. **Lions in the Grass: The Story of the Dandelion, A Green Plant.** Cleveland: The World Publishing Company, 1968. Ages 4-10, $4.95.

— **Exploring As You Walk in the City.** Philadelphia: J. B. Lippincott Company, 1972. Ages 4-10, $3.95.

Case, Marshal T. **Look What I Found!** The Young Conservationist's Guide to the Care and Feeding of Small Wildlife. Riverside, Connecticut: Chatham Press, 1971. Upper elementary, teachers, $4.95.

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Fisher, Richard (Editor) and Berrill, N. J. (Author). **The Life of The Ocean.** New York: McGraw-Hill, 1966. Adult, $4.95.

Fleck, Richard. **Palms, Peaks, and Prairies.** Francestown, New Hampshire: Golden Quill Press, 1967. Junior high and up, $4.00.

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— **The Gentle Giants.** New York: Arco Publishing Company, Inc., 1971. Junior high and up, $8.50.

Kirk, Donald. **Wild Edible Plants of the Western United States.** Healdsburg, California: Naturegraph Publishers, 1970. Adult, $5.95.

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— **Samson, Last of the California Grizzlies.** New York: William Morrow and Company, 1973. Ages 8-12, $4.25.

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— **Planning Our Town.** New York: Alfred A. Knopf, 1964. Junior high and high school, $4.99.

Nelson, Arthur H. **Trees.** San Francisco: Fearon Publishers, 1960. Junior high and up, $0.75.

Pough, Richard H. **Audubon Land Bird Guide.** Garden City, New York: Doubleday and Company, 1957. All ages, $5.95.

— **Audubon Water Bird Guide.** 1951. All ages, $5.95.

Rockcastle, Verne et al. **Elementary School Science.** Menlo Park, California: Addison-Wesley Publishing Company, 1972. Teachers Edition manuals, primer grades 1-6.

Rosner, Joan et al. **A Place To Live.** New York: National Audubon Society, 1970. Ages 8-11; children's book $1.00, Teacher's guide $1.75.

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Russell, Helen R. **City Critters.** New York: Meredith Press, 1969. Upper elementary, $3.95.

— **Ten-Minute Field Trips.** Chicago: J. G. Ferguson Publishing Company, 1973. Teachers, $6.95.

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You Among the Stars. New York: William R. Scott, Inc., 1951. Ages 8-12, $3.75.

Schultz, Beth and Marcuccio, Phyllis. **Investigations in Ecology.** Columbus: Charles E. Merrill Publishing Company, 1972. Ages 10-16 (although used on both sides of this range), $9.95.

Selsam, Millicent E. **The Tomato and Other Fruit Vegetables.** New York: Morrow, 1970. Ages 7-10, $4.50.

Selsam, Millicent and Hunt, Joyce. **A First Look at Fish.** New York: Walker and Company, 1972. Ages 2-4, $3.95.

Smiley, Daniel and Egler, Frank E. **The Natural History of Undercliff Road.** New Paltz, New York: Mohonk Trust, 1968. Adults.

Smiley, Virginia. **Views From the Mountain.** New Paltz, New York: Mohonk Mountain House, 1971. Adults, $2.00 (all proceeds go to conservation causes).

Teale, Edwin W. **Wandering Through Winter.** New York: Dodd, Mead and Company, 1965. Adult.

The Junior Book of Insects. New York: E. P. Dutton and Company, 1972. Junior high and up, $6.95.

Vinal, Cap'n Bill. **Nature Recreation.** New York: Dover, 1963. Teachers and youth leaders, $2.50.

Watts, May T. **Reading the Landscape of Europe.** New York: Harper and Row, 1971. Adult, $8.95.

Wharton, Mary and Barbour, Roger. **A Guide to the Wildflowers and Ferns of Kentucky.** Lexington: University Press of Kentucky, 1971. Adult, $9.50.

Wilson, Audrey. **Studying Birds.** Toronto, Canada: McGraw Hill-Ryerson, 1970.

Wong, Herbert and Vessel, Matthew. **Science Series for the Young.** (See titles below). Reading, Massachusetts: Addison-Wesley Publishing Company, 1969. Elementary.

My Goldfish, $4.50
My Ladybug, $4.50
Our Terrariums, $4.50
Our Tree, $4.50
Watching Animals Find Food, $4.75
Watching Animals Grow Up, $4.75
Where Can Cattails Grow? $4.75
Where Can Red-Winged Blackbirds Live? $4.75

Zim, Herbert S. et al. **Fishes** (hardbound). New York: Western Publishing Company, 1955. All ages.

Zim, Herbert S. et al. **Orchids.** New York: Western Publishing Company, 1970. All ages, $1.25.

From Tel Aviv comes a report that pollution is fouling a well in Nazareth that Christians consider one of the holiest sites of the Holy Land.

The well, according to Christian tradition, marks the place where the Archangel Gabriel told the Virgin Mary that she would give birth to Jesus.

Faud Farah, a civil engineer responsible for the water supply in Arab villages around Nazareth, said the pollution was discovered 18 months ago. He said he believes it is connected in some way with the city sewage system.

Family Fishing and Fish Management

PAUL M. KELSEY

Cottages along lakes and public campsites at our parks and in the Forest Preserve are filled with families who are trying to get away from the tensions of job or school. There will be swimming, hiking, boating and many other things to keep them busy, not the least of which will be fishing. Families that can get out together like this are giving their youngsters something that will be of long term benefit to them, and which will also be a boost to society.

Time and again it has been demonstrated that boys who have cultivated an interest in outdoor activities are less apt to become entangled with the law. They have also learned one of the secrets of relaxing from the stress of modern day life so that they can return to their routine with restored enthusiasm and vigor.

Many everyday family activities, such as little league baseball, still keep everyone going in high gear. Father and son fishing expeditions offer something to do together without the tension and competition – where man and boy can get to know each other better. Introducing a child, either boy or girl, to the wonders of a fish pond can be a most satisfying experience.

There is no age limit on fishing; in fact it is an ideal three generation sport. When a youngster is along, the trip should be geared to his level; you should accompany him on his trip instead of him accompanying you on your trip. His interest span is more or less directly related to his height, so for the youngster there should be plenty of action. Even the older novice needs action, for he hasn't built up a store of anticipation from earlier successful expeditions.

Action means panfishing – sunfish, perch and bullheads. This is where family fishing can be good fish management, for too many fisherman concentrate on the big fish, and in this way are sometimes their own worst enemies. A good fish pond must have the proper balance between large predatory fish, bass, pike, etc., and the small forage species like perch and bluegills.

Mother Nature gave the small fish a very high reproductive rate so that they could produce enough young to feed the big fish and still have enough left over to maintain their numbers in the pond. If too many of the large fish are removed, the panfish can quickly become overpopulated. This is a double-edged sword, for not only are there too many panfish for the amount of food available, but they will also eat young of the predatory fish, further reducing their numbers.

Panfishing no longer has to be a sit-and-wait proposition, for with modern spinning tackle it can be made a lively sport. Adjust the drag on the reel way down and even medium-sized perch or sunfish can put up a fight which will excite a youngster. While casting small lures for perch and sunfish he is actually learning how to properly handle the equipment, so that when he graduates to game fish he won't spend all his time disengaging lily pads.

Even panfish can be uncooperative at times, but every fisherman must learn that fishing isn't just pulling in fish. This is the ideal time to show that there is a lot more to fishing than just catching fish. By opening the youngster's eyes to the many activities of the other inhabitants of the pond, you can show him how to bring home memories that will make it possible to come home empty-handed, but refreshed. Some of these memories may long outlive the memories of even the better fish.

Almost without exception it is better for the fishing if you don't throw back the small panfish. To throw them back defeats the purpose of fishing them heavily to thin out their numbers so that those remaining have enough food to grow well.

Cleaned in the usual manner, you end up cooking a lot of fish skeletons and very little fish. Skin, and then fillet them. You won't end up with big chunks of meat, but a reasonable mess of fish will give you a neat panful of tasty little morsels all ready to fry and eat.

New York State Outdoor Education Conference

The 6th annual conference of the New York State Outdoor Education Association will be held October 5-8, 1973 at the Sit'n Bull Ranch, Warrensburg, N. Y. Workshops include studying weather, wild foods, field sketching, Adirondack old-times, bog trotting, age of homespun-out-of-doors, outdoor study areas, environmental sensitivity through language arts, bushwacking, and canoeing safety. Jerry Passer is chairman for the meetings, and Professor Bruce McDuffie will be the keynote speaker on the topic "On the Trail of Environmental Quality." The conferees will be able to preview new films and see the latest books and gadgets at several exhibits. Persons may stay at the conference site or in nearby campgrounds. Warrensburg is in the mountainous part of the Adirondacks, and the fall colors should be at their prime during this conference.

NEWS and NOTES for Environmental Education . . .

Union College Environmental Studies Program

Union College in Kentucky has developed a comprehensive environmental studies program at its education center in Middlesboro, Kentucky. The comprehensive curriculum in environmental studies is an interdisciplinary approach, blending scientific environmental facts with their implications in other fields, such as political science, sociology, geography, urban and rural planning, and health. Teachers are being trained to handle environmental or ecological units in elementary and secondary education. A special two-week workshop is held in the summer for in-service teachers with graduate credit granted towards the Master of Arts in Education degree. Union College has put into operation the NEED program of the National Park Service. The NEED approach promotes environmental awareness, emphasizing the integration of environmental concepts in all disciplines, and stressing relationships rather than scientific identification.

Bonwill's Skycroft Camps

Allan and Ellen Bonwill continue to use their 2,000-acre nature preserve just north of the Thousand Islands in Ontario, Canada, for environmental education. Teachers, school administrators, college professors and others involved in childhood or adult education and interested in environmental matters are urged to bring their groups to this area for nature study. Each group supplies its own leadership, tentage, cooking, etc., and the Bonwills supply some guidance in the local area and certain support systems such as telephones, freezer space, canoe and swimming instruction, and trail guides for the 20 miles of trails. Cost is a very nominal $1.00 per night per person.

This is a good example of the kind of use which can be made of privately owned lands for environmental education. Vigorous environmental programs can be run without the investment of large sums of money in acquiring real estate.

Doug Wade Runs Wilderness Course

Douglas Wade, professor at Northern Illinois-Lorado Taft Field Campus, is conducting an environmental study course in the Quetico-Superior Canoe Country and Isle Royale National Park during the summer of 1973. This is a canoe expedition, and is intended to involve its participants in an in-depth encounter with the natural environment and with one another. During the course of the expedition, each person will be involved in a personal enrichment project, such as art, creative writing, economics, sociology, history, natural history, geology, and ecology. Each day students will devote some time and effort to pursuing their project. Each participant is asked to fill out an attitude and behavior questionnaire, and the group will be involved in a sharing session prior to departure, so that everyone involved will know and appreciate everyone else. Here is another example of the merging of environmental studies with the development of human relationships.

New Regional Quarterly

Nancy B. Cole, former student of Dr. Richard Fischer at Cornell, announces that she intends to begin publication of a new regional journal called the "Northeast Wildlife Quarterly" in the fall of 1973. This will be the outdoorsman's ecology and wildlife magazine that the whole family will enjoy. It is designed to bring together the many aspects of wildlife ecology and management, outdoor sports and conservation. Each issue will be filled with information about the wildlife of the northeast, interesting facts and details about the lives of many species. In addition, there will be tips on outdoor activities, wild foods and game cookery for home or camp, suggestions for family outings, places to go and things to do, and a children's page of nature facts, quizzes and crafts.

The editor of this new journal is seeking manuscripts and photographs (black and white glossy prints) for publication. Persons interested should send material to Nancy B. Cole, Editor, Box 86, Lansing, New York 14882.

Subscription rates for this new quarterly are $5 for one year.

Environmental "Sensitivity" Programs on the Increase

The emerging awareness of the fact that environmental education includes an awareness of the problem of human alienation from the natural world has resulted in a number of programs designed to foster a new sensitivity. One of these programs is the Falls Creek Basic Awareness Project, sponsored by the Falls Creek Environmental Education Foundation in Condon, Montana. The project has been underwritten by a grant from the Environmental Education Act of 1970. Fundamental to the concept of the Falls Creek Project is the recognition of the basic interdependence of people and reliance on the earth's limited resources. It sees a need for environmental concerns to embrace man's social communities as well as natural surroundings.

Out of these kinds of new approaches to environmental education will come many good ideas for application throughout the country. One of the important goals of the newly formed Alliance for Environmental Education is to identify and evaluate these new approaches and disseminate information about them as quickly as possible to all interested persons.

Have You Met Elizabeth?

Elizabeth Lawrence, long-time ANSS member, is going great guns in Massachusetts. Active with the South Shore Natural Science Center in Norwell, Massachusetts, the home town of Cap'n Bill Vinal, she is fairly bursting with good ideas for environmental education, and with remarkable results from their implementation. She initiated a "mothers and others" course, with sessions including seed jewelry and nature crafts, a trip to the tidal pools for wintering ducks, rocks and minerals, conservation report, nature walks to Black Pond and around the grounds of the Center. Babysitting was provided, and the mothers (and others) were as wide-eyed and happy as children.

She also initiated a Plant Progagation Night which brought out sixty-five people who wanted to learn how to get new plants from old. The Science Center sponsors Saturday clubs for people of all ages to participate in workshops through the winter. Many groups of children from the nearby schools come to visit the Center throughout the year.

In the newsletter of the Science Center, we read this tribute to Elizabeth Lawrence: "Having Elizabeth Lawrence here is like having the sun come out. Most of our recent activities have been the results of her planning and getting cooperation from many people. We are all sharing in her wealth of knowledge and acquaintances and becoming the recipient of valuable materials she has collected through her years of teaching and exploring. Her attic full of science treasures is slowly working its way over from her home in North Scituate. Her boundless energy and enthusiasm are felt by all, and no job is too big for her to take on."

Other ANSS members with boundless

energy and experience in nature study ought to emulate Elizabeth and get programs started in their own communities. She can provide you with lots of ideas. Why not drop her a line:

Miss Elizabeth Lawrence
22 Indian Trail
North Scituate, Massachusetts 02060

Vinal Library

Friends and associates of Cap'n Bill Vinal are setting up a library in his honor at the South Shore Natural Science Center in Norwell, Massachusetts. It was Cap'n Bill's initiative in 1962 which got the South Shore Natural Science Center started. In 1964 he gave the Center some of his works to publish and also some of his published books. Donations received in memory of Mrs. Vinal will be used to establish this library. Cap'n Bill has decided to donate his own collection of books to the Science Center.

Funds are now being raised to purchase the necessary units for holding this collection. It is hoped that this can be accomplished while Cap'n Bill can share in the pleasure of seeing the establishment of this memorial to his wife.

Contributions should be sent to the Vinal Library Fund, South Shore Natural Science Center, Inc., Jacobs Lane, Norwell, Massachusetts 02061.

Round River Experiment

The University of Montana at Missoula has developed the Round River Experiment in environmental education. It intends to begin the process of recovering the capacity to hear the world as the Indian did. The year-long program is a community of learning in which individuals participate fully in exploring man's relationships with nature, with himself, and with society at large. The program is conducted off campus in different seasons for approximately 10 weeks of the year, including wilderness backpacking, trips to national parks, and extended stays at a biological station at Flathead Lake. The program is designed for 100 students with five faculty members from different academic backgrounds.

The Round River Program is an experiment in at least three respects. First, the program attempts to be fully integrated in its approach to learning. It assumes that a philosopher and a poet can know enough about the natural environment to discuss general scientific questions in seminars, and that scientists can intelligently and warmly entertain the idea of poets and philosophers. Second, the Round River participants work together as members of a close-knit community. Relationships among all members, faculty and students, are informal and personal. Participants learn to work together and to respect and foster the uniqueness of each individual at the same time. Third, Round River provides many opportunities for each participant to organize his own time. The program is relatively unstructured: there are no examinations and the only required paper is an evaluation by the student of his own performance at the end of each quarter. Each group of 20 students establishes its weekly schedule, and each individual is largely responsible to himself for the way in which he makes use of his time.

Round River is a full-time program, requiring a full-time commitment, and students may not enroll in other classes during the same period. All participants must be admitted to the University of Montana as full-time students.

Gerald Schneider in Consulting Work

Gerald Schneider is now available to consult with organizations and educational groups around the country. He can conduct urban environmental education workshops, develop printed and audio-visual environmental education materials, organize and direct conferences, assist in grant proposal writing and funding and help environmental groups with their organization problems. He is doing this by himself and in consortium with associates who are professional writers, planners, photographers and environmentalists in a new corporation, International Environmental Education Services, Inc. (IEES).

IEES is also in the business of helping other environmentalists develop and fund worthwhile environmental education and related projects. Persons with project ideas should outline those ideas and discuss them with Mr. Schneider. Quality of idea and the ability of an idea proposer to assist in carrying out projects are more important than credentials and established standing in the environmental field.

Correspondence should be addressed to Mr. Schneider at 1520 Gridley Lane, Silver Spring, Maryland 20902; telephone (301) 649-2304. More information available on request.

Bostonians Move To Save Open Space

A number of organizations in the Boston area, including the Conservation Commissions of Boston, Newton and Brookline, and the Charles River Watershed Association and West Roxbury Historical Society, are working together to bring about the consolidation of existing open spaces between downtown Boston on the Charles Basin and the Sawmill Brook Marshes near historic Brook Farm at the west end of the city, into a green belt 8½ miles in length. Included in this "Charles to Charles" Corridor Park would be the famous Arnold Arboretum of Harvard University, Jamaica Pond and the Fenway, and Olmsted Park. Much of the land is already in public ownership, but there are key segments of private land which must be included.

The planners envision this park as an extension of the Boston Park system originally designed over 100 years ago by Frederick Law Olmsted. Olmsted was America's first landscape architect. He created many parks throughout the country, including Boston's Franklin Park and the famous Central Park in New York City. Olmsted was a visionary who saw the need for open spaces in urban areas long before the environment became a major issue. The Charles to Charles Corridor winds through acres of green space, brooks, streams and ponds, wildlife sanctuaries and cemeteries.

The goal of the planners is to get this new park ready for the celebration of the nation's bicentennial in 1976.

E. E. Publishing Service Established

A new organization, the Environmental Education Publishing Service, has been established by John Haas, Charles Doyle, and Robert Snell in Eatontown, New Jersey. The purpose of this organization is to make available a variety of useful environmental education materials for both educators and learners. Scheduled for publication in the near future is a Study Guide Series, including guides to the study of fresh water, seashores, woodlands, marshes, and dirty water. Each guide has a grade level curriculum manual for use with student packages.

The EEPS also provides curriculum assistance, resource development, trail planning and layout advice, environmental surveys, workshops, and environmental consulting. Inquiries should be addressed to:

EEPS
217 Wyckoff Road
Eatontown, New Jersey 07724

Birds Get New Names

The Thirty-second Supplement to the Checklist of the American Ornithological Union lists certain changes in the common names of some of our bird species. Such changes are made occasionally when there are refinements in the classifications of birds, especially with regard to subspecies. Some of the changes of more common species are:

Common Flicker, composed of subspecies Yellow-shafted, Red-shafted, and Gilded.

Traill's Flycatcher, with two subspecies, the Willow Flycatcher and the Alder Flycatcher.

Yellow-rumped Warbler, consisting of the subspecies Myrtle Warbler and Audubon's Warbler.

Northern Oriole, with the subspecies Baltimore Oriole and Bullock's Oriole.

Dark-eyed Junco, with the subspecies White-winged, Oregon, Slate-colored and Guadalupe.

Great-tailed Grackle is now considered a separate species from the Boat-tailed Grackle.

The Ipswich Sparrow is considered a subspecies of the Savannah Sparrow.

The San Lucas Robin is considered a subspecies of the American Robin.

In several instances English names have been changed: Sparrow Hawk to American Kestrel, Common Egret to Great Egret, Yellowthroat to Common Yellowthroat, and Catbird to Gray Catbird.

Alliance Moves to Secure Funding

The Alliance for Environmental Education, under the leadership of Dr. Kenneth Dowling and its executive director, William Lynch, is moving ahead to obtain financial support from foundations for its activities. The Alliance hopes to have a full-time executive director appointed by September 1, 1973, and to locate its headquarters in the Washington, D.C. area in the fall of this year. Representing twenty organizations with over 11,000,000 members, the Alliance has an important role to play in the development of environmental education programs in this country. Environmental education is as diverse as the environment itself, and each organization involved has its particular emphasis. Only as these are brought together to focus on the major problems can we expect an effective environmental education program to emerge.

The Alliance has listed a number of benefits which should be realized by organizations participating in its programs:

1) identification by the Alliance and its staff of common needs and initiation of appropriate activities to meet these needs;
2) identification of and facilitation of subgrouping of participating organizations concerned with specific issues not necessarily the concern of the entire Alliance;
3) systematic collection and dissemination of information concerning environmental education activities, programs and events;
4) facilitation of research efforts of participating groups;
5) technical assistance in developing and coordinating proposals for funding and implementing and evaluating programs and research;
6) services related to employment opportunities in the environmental education field.

British School Children Plot the Air

ANSS president Kingsley Greene, who has been spending the first six months of this year in England, sends a report published in the *Sunday Times* of London which describes a project conducted by 15,000 school children last summer. This project was organized by the Advisory Centre for Education in conjunction with the *Sunday Times Magazine*. The children examined lichen growth in various places, and noticed that it was being adversely affected by air pollution from nearby industries. Survey report forms were filled out by the children, and essays on various aspects of what they found were written and submitted. As a result of all this activity, a new organization called WATCH, a club for children, has been organized. Patterned much like the PYE Clubs which have been reported before in NATURE STUDY, these WATCH Clubs enable children and their families to become involved in solving the problems of environmental abuse.

"Simply Seeing" — A Unique Environmental Awareness Program

One of our newest members, John Briggs of Missoula, Montana, has developed an environmental awareness slide-tape presentation which is being widely shown in the west. Three years ago, when John was a student in high school in Novato, Calif., he developed a fifteen minute presentation as a class project, and subsequently used it in a number of schools, conventions, and other organizations throughout California. Within a year and a half he had shown it 150 times to over 9000 people. Making no charge, and often paying his own expenses, he continues to show his remarkable program "just to reach people with the message of love for life . . . nature."

At this time the U.S. Forest Service is circulating the program throughout Region I, greatly expanding the influence of the program – and in a vicarious way, of the ideals and enthusiasm of Mr. Briggs. John is at the University of Montana now, involved in the Round River project described elsewhere in this issue. He is working with the I & E office of the Forest Service to set up educational workshops for teachers this summer. He hopes to involve a majority of the 900 K-12 teachers in the northwestern part of Montana, helping them integrate environmental education into the whole curriculum. The main aim is to bring about essential attitude changes . . . a new "awareness."

"Simply Seeing" involves the music and lyrics of a number of current popular songs and singers, such as Simon and Garfunkle, which, with appropriately synchronized slides, brings home a basic eco-message. We hope many ANSS members will be able to see it – and perhaps to create something similar with a regional flavor for their own communities.

Two New Extension Courses in "Environment and Citizen"

To meet the needs of a growing number of people interested in learning how to help solve environmental problems, the University of Michigan recently announced two new independent study courses on "The Environment and the Citizen."

The two courses will be offered for the first time in September 1973, with a maximum enrollment of 1,000. It is open to high school and college students, as well as non-students, anywhere in the world. Fees are $64 for each course (7 units) taken for either academic or non-academic credit and an additional $12.50 for the text and learning kit. The fee for anything less than 7 units will be $15 per unit.

Instructor of the courses is Dr. William B. Stapp, Professor of Environmental Education in the School of Natural Resources of the University of Michigan, and former ANSS President.

Developed and tested by Dr. Stapp over a five-year period, each course consists of a printed text and a series of activities, designed to help participants apply the text to local and regional situations. Community surveys and interviews, as well as more traditional review questions and papers, are among the activities included.

The first course (2 academic credits) consists of three required "core" units and four elective ones. The core units are: Man and the Environment; Population and Urbanization; and Ecology. Upon completing the "core" units, participants may choose any four of eleven elective units, which are: Government Policy and the Environment; Economics and the Environment; Urban and Regional Planning; Soil Resources; Tree Resources; Water Resources; Fishery Resources; Wildlife Resources; Air Resources; Outdoor Recreation; and The Role of the Citizen.

A second course (2 academic credits) is offered for participants who want to study the remaining seven electives.

For individual participants the entire course is available through independent study at the student's own pace through the Department of Independent Study of the University of Michigan Extension Service. The courses are designed so that organizations may participate as a group and meet regularly to discuss course material and to share learning experiences.

Those who complete the courses without academic credit will receive a certificate acknowledging their involvement.

The course materials were developed under a grant from the Ford Foundation, in cooperation with the Michigan Department of Natural Resources and the Independent Study Department of the University of Michigan.

For more information or enrollment forms, write: Department of Independent Study, Extension Service, University of Michigan, Ann Arbor, Michigan 48104.

Smithsonian Institution - Peace Corps Environmental Program

During the past two years there has been a very significant increase in the number of Peace Corps Volunteers requested by developing countries for assignment to projects dealing with environmental problems. A large share of this increase has occurred in the fields of natural resource conservation and ecological research. Assignments cover a very broad spectrum of scientific and technical fields: forestry, fisheries, wildlife management, national park planning and management, ecological research, marine biology, watershed management, environmental monitoring, preservation of endangered species, air and water pollution research, water resource development, conservation education, and environmental health. Volunteers may work directly in a host government program or may be attached to a scientific or conservation organization in the host country.

In order to recruit volunteers for these specialized assignments, the Peace Corps operates a combined program with the Smithsonian Institution specifically intended for applicants who have completed candidate status for a Master's or Doctor's degree or who hold such degree. The Smithsonian participates in the development of assignments overseas and in the selection and placement of qualified applicants.

Persons interested should write the Office of Ecology, Smithsonian Institution, Washington, D. C. 20560.

Environmental Education fifty years ago . . .

EDITOR'S NOTE: From its founding in 1908 to the establishment of Nature Magazine in the '20's, the official organ of the American Nature Study Society was NATURE-STUDY REVIEW. Published most every month, the REVIEW cost $1.50 a year or 20 cents a copy. It was edited for several years by Anna Botsford Comstock, whose "Handbook of Nature Study" is still widely used. The following is the facsimile of the membership application for ANSS from the September 1923 issue.

DUES

Annual membership in U.S., $1.50; annual membership abroad, $1.75; Canada, $1.60. Please make remittance payable to The American Nature Study Society.

RECOMMENDATION FOR MEMBERSHIP
IN THE
American Nature Study Society
President, WM. G. VINAL, Providence
Secretary, ANNA B. COMSTOCK, Ithaca, N. Y.

The Membership Fee Includes Subscription to the Nature-Study Review

PLEASE DETACH AND FILL IN BLANK BELOW AND SEND TO THE SECRETARY

.....192

To the American Nature Study Society
Ithaca, N. Y.

I nominate .....

Business or Profession .....

Address .....

.....

for membership in the Society .....

Name and Address of Nominating member

(It is suggested that you inform the Nominee of your recommendation and of the benefits of membership)

WETLANDS NATURE STUDY

PAUL M. KELSEY

It must have been in 1967 that I first took a group of sixth graders from Brighton-McKinley School in Syracuse, N. Y to Three Rivers Wildlife Management area. Our visit occurred almost simultaneously with the release of a report to the Onondaga County Board of Supervisors in which a firm of consulting engineers made recommendations for future waste disposal sites in the County. Twenty-nine of the 33 sites recommended were wetlands.

Talking with students about the value of wetlands, it became apparent their ideas were typical of those of the usual adult urban resident, that these areas were of little or no value and that their ultimate use was a place to put junk and garbage from the city. To one whose ideas of a swamp are filled with mosquitos and snakes, this probably makes sense.

Our aim that day was to change this attitude about the place of the swamp, or wetlands, in their sense of values. Their field exploration was preceded by a few minutes discussion of the fertility and life potential of these wetlands. It was brought out that many types of life depended on them for at least part of their life, and that without them, many types of fish, amphibians, reptiles, insects and other types of life would disappear. With half a dozen scoops with my net, I showed them how to find what was living in the weedy vegetation along the shore of one of the ponds. In a few minutes we examined and identified quite a variety of aquatic life.

I don't kid myself that they remembered many names, but as they started wielding their own nets and collecting their own specimens, I am sure that the importance of wetland areas in the cycle of life began to take on new meaning.

Declaration On The Human Environment

In the summer of 1972 the United Nations held its historic Conference on the Human Environment in Stockholm. Out of this conference came the creation and adoption of Twenty-six Principles, which constitute the Declaration, and 109 steps in an Action Plan by which these principles will be brought to reality. They constitute a blueprint for human and ecosystem survival. They were ratified by the General Assembly in December, 1972. We publish the Twenty-six Principles here so that our readers will understand the extent to which the U.N. has committed its prestige and its member states to improvement of environmental quality.

DECLARATION OF PRINCIPLES

States the Common Conviction That:

PRINCIPLE 1 – Man has the fundamental right to freedom, equality and adequate conditions of life in an environment of a quality that permits a life of dignity and well-being, and he bears a solemn responsibility to protect and improve the environment for present and future generations. In this respect, policies promoting or perpetuating "apartheid," racial segregation, discrimination, colonial and other forms of oppression and foreign domination stand condemned and must be eliminated.

PRINCIPLE 2 – The natural resources of the earth including the air, water, land, flora and fauna and especially representative samples of natural ecosystems must be safeguarded for the benefit of present and future generations through careful planning or management, as appropriate.

PRINCIPLE 3 – The capacity of the earth to produce vital renewable resources must be maintained and, wherever practicable, restored or improved.

PRINCIPLE 4 – Man has a special responsibility to safeguard and wisely manage the heritage of wildlife and its habitat which are now gravely imperiled by a combination of adverse factors. Nature conservation including wildlife must therefore receive importance in planning for economic development.

PRINCIPLE 5 – The non-renewable resources of the earth must be employed in such a way as to guard against the danger of their future exhaustion and to insure that benefits from such employment are shared by all mankind.

PRINCIPLE 6 – The discharge of toxic substances or of other substances and the release of heat, in such quantities or concentrations as to exceed the capacity of the environment to render them harmless, must be halted in order to ensure that serious or irreversible damage is not inflicted upon ecosystems. The just struggle of the peoples of all countries against pollution should be supported.

PRINCIPLE 7 – States shall take all possible steps to prevent pollution of the seas by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.

PRINCIPLE 8 – Economic and social development is essential for ensuring a favorable living and working environment for man and for creating conditions on earth that are necessary for the improvement of the quality of life.

PRINCIPLE 9 – Environmental deficiencies generated by the conditions of underdevelopment and natural disasters pose grave problems and can best be remedied by accelerated development through the transfer of substantial quantities of financial and technological assistance as a supplement to the domestic effort of the developing countries and such timely assistance as may be required.

PRINCIPLE 10 – For the developing countries, stability of prices and adequate earnings for primary commodities and raw material are essential to environmental management since economic factors as well as ecological processes must be taken into account.

PRINCIPLE 11 – The environmental policies of all States should enhance and not adversely affect the present or future development potential of developing countries, nor should they hamper the attainment of better living conditions for all, and appropriate steps should be taken by States and international organizations with a view to reaching agreement on meeting the possible national and international economic consequences resulting from the application of environmental measures.

PRINCIPLE 12 – Resources should be made available to preserve and improve the environment, taking into account the circumstances and particular requirements of developing countries and any costs which may emanate from their incorporating environmental safeguards into their development planning and the need for making available to them, upon their request, additional international technical and financial assistance for this purpose.

PRINCIPLE 13 – In order to achieve a more rational management of resources and thus to improve the environment, States should adopt an integrated and coordinated approach to their development planning so as to ensure that development is compatible with the need to protect and improve the human environment for the benefit of their population.

PRINCIPLE 14 – Rational planning constitutes an essential tool for reconciling any conflict between the needs of development and the need to protect and improve the environment.

PRINCIPLE 15 – Planning must be applied to human settlements and urbanization with a view to avoiding adverse effects on the environment and obtaining maximum social, economic and environmental benefits for all. In this respect, projects which are designed for colonialist and racist domination must be abandoned.

PRINCIPLE 16 – Demographic policies, which are without prejudice to basic human rights and which are deemed appropriate by Governments concerned, should be applied in those regions where the rate of population growth or excessive population concentrations are likely to have adverse effects on the environment or development, or where low population density may prevent improvement of the human environment and impede development.

PRINCIPLE 17 – Appropriate national institutions must be entrusted with the task of planning, managing or controlling the environmental resources of States with the view to enhancing environmental quality.

PRINCIPLE 18 – Science and technology, as part of their contribution to economic and social development, must be applied to the identification, avoidance and control of environmental risks and the solution of environmental problems and for the common good of mankind.

PRINCIPLE 19 – *Education in Environmental matters, for the younger generation as well as adults, giving due consideration to the underprivileged, is essential in order to broaden the basis for an enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension. It is also essential that mass media of communications avoid contributing to the deterioration of the environment, but,*

on the contrary, disseminate information of an educational nature on the need to protect and improve the environment in order to enable man to develop in every respect.

PRINCIPLE 20 – Scientific research and development in the context of environmental problems, both national and multi-national, must be promoted in all countries, especially the developing countries. In this connection, the free flow of up-to-date scientific information and transfer of experience must be supported and assisted, to facilitate the solution of environmental problems; environmental technologies should be made available to developing countries on terms which would encourage their wide dissemination without constituting an economic burden on the developing countries.

PRINCIPLE 21 – States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

PRINCIPLE 22 – States shall cooperate to develop further the international law regarding liability and compensation for the victims of pollution and other environmental damage caused by activities within the jurisdiction or control of such States to areas beyond their jurisdiction.

PRINCIPLE 23 – Without prejudice to such criteria as may be agreed upon by the international community, or to standards which will have to be determined nationally, it will be essential in all cases to consider the systems of values prevailing in each country, and the extent of the applicability of standards which are valid for the most advanced countries but which may be inappropriate and of unwarranted social cost for developing countries.

PRINCIPLE 24 – International matters concerning the protection and improvement of the environment should be handled in a cooperative spirit by all countries, big or small, on an equal footing. Cooperation through multilateral or bilateral arrangements or other appropriate means is essential to effectively control, prevent, reduce and eliminate adverse environmental effects resulting from activities conducted in all spheres in such a way that due account is taken of the sovereignty and interests of all States.

PRINCIPLE 25 – States shall ensure that international organizations play a coordinated, efficient and dynamic role for the protection and improvement of the environment.

PRINCIPLE 26 – Man and his environment must be spared the effects of nuclear weapons and all other means of mass destruction. States must strive to reach prompt agreement, in the relevent international organs, on the elimination and complete destruction of such weapons.

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