TREES AND PEOPLE[1]

by Marion Hall

The perspective. The Morton Arboretum and most of the other arboretums around the country are *not* selling trees for profit but are selling trees conceptually and ideologically. I believe this is very important to all of us. Economic well being is essential to our way of life but non-economic values in the long run give much needed strength and stability to the economy. They focus on real wealth, an emphasis on a sound, healthy steady state in our natural life sustaining systems and on the important human values of esthetics, ethics, morals, and freedom to develop innate creativity. These come from an understanding, appreciation, and reverence for life, all life. When we say "trees" we think of various products, various services and functions of a specialized nature, but of greater importance we think of them as living organisms and the roles they play in supporting that complex web of life which sustains mankind. The point is that trees are important to man as objects used for many varied purposes from esthetic to utilitarian but more important is their role as a part of the forest ecosystem. At the Morton Arboretum we go to great lengths to get this message across to our public.

One of our more serious shortcomings is the unilateral, simplistic, pragmatic attitude we take toward the environment where we consider strictly production criteria as the major value of our land. For example, the goal of agriculture or intensive forestry is to achieve high rates of production of easily harvestable products with little or no standing crop to accumulate on the landscape. Such landscapes are similar to ecologically young ones where production, growth, and quantity are emphasized. Some ecologists call these retrogressive landscapes with the following characteristics: simplicity, uniformity, independence (little or no mutualism), instability, a low number of species, high entropy (i.e., low total energy, but nearly all of it is a utilizable product), and a high cost of management. We need production environments, but we need even more so other environments. We all know that man does not live by food and fiber alone. He needs a balanced carbon dioxide-oxygen atmosphere, the climatic amelioration provided by oceans, lakes, and masses of natural vegetation (natural ecosystems), and clean water for cultural and industrial uses, the varied habitats which house the essential organisms for recycling elements, especially carbon, hydrogen, oxygen, and nitrogen essential to man's existence on the earth. These environments are called mature ecosystems or sometimes steady state (evolutionary) environments by ecologists. They are characterized by: complexity, diversity, interdependence (high degree of symbiosis or mutualism), stability, a steady state type of energetics, low entropy (high total energy distributed through a variety of interacting systems), good protection and quality. These environments are nature made providing services that make them a proper home for man and one where nature does the managing at little or no cost to man. We need both kinds of landscapes. Certainly the best and safest landscapes to *live* in are those with a variety of crops, forests, lakes, streams, marshes, shores, and even waste places and in varied stages of succession, i.e., a rich mixture of communities of different ecological ages.

Since the Morton Arboretum is an urban institution we have a special obligation to place these ecological concepts in the perspective of the city and we do this on a broad front: in our classes, field trips, lectures, seminars, symposia, meetings, consultations, exhibits, and in our research and publications. How does ecology relate to the city from the perspective of natural systems?

Ecology and the urban scene. Ecology is the study of the interrelations between organisms and their environments. Broadly, the dynamism involves complex interactions between climate,

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organisms, and soils in a context of a layered (anisotropic) distribution of essential matter in the air, earth, and water. An ecosystem is a relatively stable piece of this complex overall system, which in essence cycles and recycles matter in essential form for the maintenance, literally self-perpetuation of the system, but allowing for slow and generally directed change. Disruptive forces which affect climate, organisms, or soils, either alone or in combination, cause changes which often result in the destruction of the system. A healthy ecosystem is then one in which the changes are a result of natural, low-energy or small-step processes from within or carefully directed from without.

All forms of life modify their contexts. The essence involves relative degrees of stability: the old field is dynamically instable and changes rapidly; the climax forest is stable and changes very slowly measured in hundreds of thousands of years. The most spectacular instance of modification is doubtless the coral polyp in the formation of the coral reef, literally a land builder "while you wait." When man became numerous, he affected his environment in obvious ways. His use of fire as a method of hunting, i.e., the fire-drive, cliff fall kill method, probably helped to create the world's great grasslands and helped to exterminate the rich fauna of large mammals which roamed the world during the Pleistocene, only vestiges of which are left in modern Africa. With the dawn of agriculture, man began taking from the land as harvest more than he gave back to it and great changes resulted.

In the wilderness mist-forests of Central America, there is no area that with some well planned digging does not yield a few potsherds to the archeologist. The banks of great rivers, the lower Nile, the Tigris and Euphrates, the Indus are human artifacts and have been for several millenia. These are not only cradles of civilization, but age-old exhibits of man's destructive dominion over nature. Everywhere in the world where there have been too much time and too many people the outlook for man is wholly dismal. The great deserts of the world have become better examples of exhibits of the inhospitable through man's curatorship. In many regions terracing or irrigation, overgrazing, the cutting of forest by the Romans to build ships to fight Carthaginians or by Crusaders to solve logistic problems throughout scorched earth, have profoundly affected our ecologies.

The gist of the matter is that man's record with respect to a healthy ecology is not a good one. Even today with all our science, an unbelievable number of the world's species are threatened with extinction and many species have already given up the breath of life in recent times. Since man has inherited an exploitative view of nature, he must either change that view or get about learning how to "exploit" rationally, fairly, and with discretion. Our greatest scientific and practical need today is to know just how much of the ecosystem's energy or resource man can siphon off for his own needs without setting in motion those destructive forces which bring the ecosystem down to nothing. We must learn to eat at the table of nature without upsetting the harmony, balance, or restorative powers of our host. It is time for men to commit themselves to a deep study of nature, however difficult it may seem to dedicate time and money to it. It is easy to say that people prefer landscapes humanized and that wilderness is acceptable only after the "howl" is gone. Men may like to tame wilderness, but this does not mean that they are well off without it altogether.

Human behavior is complex and there are yet a few unknowns, so that we are still ignorant of what men, in their conscious or subconscious brains, need from the world that has always offered vivid mysteries and succor. One never gets far from intimations of man's exemption from ecological rules and his superiority over beasts. Western Man, again with his exploitative view of nature, often insists that people must not be interfered with, since man is a part of nature and whatever he does is therefore natural.

If Sartre and Camus are correct in their views that man is essentially irrational, then man is indeed in a bad way. His role is and will likely remain destructive until his doom is sealed. Our most fearful destructiveness today is a result of collusion among great numbers of men, that is, where corporate decision allows a science of ecology and provides for its nominal support but all the

while destroying its subject matter (the natural environment) at continually accelerating rates. Man is surely the only creature which demonstrates such a diabolic schizophrenia.

Indeed, the more we look at the matter, the more it appears that Camus was right — man is irrational. Corporate man's innovative destructiveness then brings us to the problem of ecology and the city, where a tree of heaven here, a bit of knotweed or crabgrass there, becomes the cathartic replacement of a formerly vibrant ecosystem. Then indeed, what is urban man? He is a creature of the city, another kind of desert.

There are mysteries left in lawns and city lots. An honest student of the sunflower or of crabgrass has a great story to tell. Perhaps crabgrass and man have too much in common, and the practices which bring them together should be pointed to and shamed. The ecologist of the city might pioneer and teach us that enriching our landscape with native plants is a surer way to a gardener's dream than resorting to chemical crabgrass killers.

The ecologist learned long ago that a healthy ecosystem, consisting of natural vegetation, possessing modest diversity requires the least effort to maintain while offering the greatest beauty. Paul Sears said effectively and simply "an ugly landscape is a diseased one, and . . . an effective landscape is satisfying to the eye."

One can study the ecology or genetics of a city lot with nothing more than crabgrass, but there is no challenging ecology without a considerable temporal and biotic continuity that exceeds that of any laboratory or any city lot. Luna Leopold, geologist for the U.S. Geological Survey, said, "The ecological community is worthy of study in a search for valid principles only if natural biological and physical processes are in operation. To describe a biota there is no substitute for a sample." Leopold's remarks ought to make those who sneer at natural areas and wilderness feel a little uncertain. Quite legitimate proponents of nature conservation can also take comfort from another of Leopold's observations: "In some instances visible signs of accomplishment of conservation, signs of having done something, may be less important than visible signs of having done nothing. When you find a little remnant of prairie flowers, you may thank your lucky stars for this visible sign that man has done nothing here."

All of this implies order in nature, perhaps many orders. But I think that very little of that order can be found in a city. Ecological processes can operate in a city but the order of difference is that between a simple melody and a Beethoven symphony. Ecologically, we are fooling ourselves not by the objectivity of our facts, but by their triviality and lack of relatedness. Nature's richness, surely, is outside of man and prior to him, even dependent upon its outsideness and priority, and also its complexity.

Classification and management. Two areas of attack are open to us with respect to problems of environmental quality in the city. The first involves an attack within the city itself. The second should be a broader movement involving peripheral areas, an attack from without, so to speak. The tools for planning an effective program for influencing environmental quality involve a classification of those environments. To repeat, there are two basic kinds of environments which occupy opposite poles: one is a *retrogressive environment* and the other, a *steady-state environment.*

A retrogressive environment is one that is of poor quality ecologically. This would be one that shows the following characteristics: simplicity, uniformity, independence, instability, a low number of species, and high entropy, i.e., low total energy and a poor distribution of potentially utilizable energy. For our purposes the retrogressive environment is primarily manmade and from abuse and exploitation.

The steady-state environment is the other extreme, a healthy environment which shows complexity, diversity, interdependence — that is, a symbiosis of mutualism — stability, a steady-state type of energetics, and a high number of species and low entropy, i.e., a high total energy and a good distribution with respect to its utilization. The steady-state environment is nature-made, one that has evolved resulting in complex, steady-state systems through centuries and eons of trial and error.

These two environments are what we have to

work with. Unfortunately, there is too much of the retrogressive and there is not enough of the steady-state environments; so this simply means that where we have steady-state environments we need to classify them and we need to protect them from exploitation.

On the other hand, we have the retrogressive environments which we must bring up towards the characteristics that are typical of the steady-state environments insofar as possible. This is a very highly desirable and economic situation. We can talk about the value of money, well, now we are talking about real wealth. If we lift the attributes of these environments, we will have real wealth. These environments work for all life; there is no greater wealth than that.

We must find out how to classify the resources of our states, our country, and of the world in such a way as they relate to these retrogressive and steady-state environments. In other words, we need to characterize them on the basis of their true values and then we need to handle them after that, whether planned and worked with and improved, or whether left alone completely on the basis of the figures that we get after we run through a multi-variate characterization from a computer bank, so to speak. The next job for ecologists is to show us how we can draw off energy from those habitats classified for management without tipping the scale toward a retrogressive environment. Real management will lie in achieving a distribution of energy in the habitat so balanced and buffered that intelligent utilization will not alter its quality or set a chain reaction toward destruction as is now the case.

At the Arboretum we classify our own landscapes and others around our region as a public service. We use several techniques, those of the field of ecology — total basal area, total density, importance values; stratum ranking; Raunkiaer frequency indexing; and a new technique, natural area rating indexing. The natural area rating index was developed by our staff research assistant, Gerould Wilhelm. It is based on floristics where a numerical rating is given each species of a community based on its estimated importance. This information is plugged into a formula which yields a *natural area rating index.* In our area a rating of 40 to 50 is typical of fairly natural ecosystems in northern Illinois; rating below 40 successively is typical of the more abused, degraded, or retrogressive landscapes.

The forests of the Morton Arboretum form a vegetational mosaic consisting of 22 tracts which are reasonably homogeneous. All retain an intactness from earlier times and exhibit marked similarity to the pre-settlement forests of the area described by land surveyors from the original survey in the 1830s.

The dominant species in these stands number only six: white oak, bur oak, red oak, sugar maple, linden, and white ash. The most frequent combinations in the 22 stands are white oak-bur oak (five stands) and white oak-red oak (four stands). Of the remaining 13 stands seven are recorded once, three are recorded twice, and four are recorded three tims. White oak is listed as a dominant or codominant in 17 of the 22 stands; red oak in 13; and bur oak in eight.

There is a discernible increase in numbers of red oaks and sugar maples as one progresses eastward through the forest stands of the Morton Arboretum. Bur oak tends to be more abundant toward the west and on the fringes of the complex of stands in the Arboretum. White oak is present throughout the various stands but decreases in abundance in the red oak and sugar maple areas of the eastern portion. Native woody understory is generally present in sufficient quantity to indicate future successional trends. White oak and bur oak saplings are relatively sparse; red oak and sugar maple saplings are abundant in several stands. In certain areas young white ashes and lindens are common. There is an excellent herbaceous cover of spring wildflowers. The Wilhelm Natural Area Index Rating is around 50; total basal area, total density is above 100 for each. This fine woodland costs the Arboretum essentially nothing for maintenance. Since it is a community in steady state, nature manages it for us. about half of our landscapes are low cost.

At the other extreme are high cost areas of maintenance, e.g., the hedge garden; the shrub collection; Joy Path gardens; the areas around our buildings. We are structuring research to answer the question, can we develop tree-

dominated low maintenance, but pleasing landscapes for our formal or intensively used areas. These areas do not even rate on the rating index. They are ecologically retrogressive.

People. Our public is representative of all types of Americans: the poor, the handicapped, young, old, rich, laymen, professionals — all kinds. Predominantly they are middle class, urban citizens. Every year 500,000 of them come through the Arboretum gates. We have direct contacts with 40,000 of these through classes, field trips, tours, lectures, seminars, symposia, workshops, short courses, festivals and fairs. We have yet more thorough and significant contacts with our couple of thousand members, dedicated alumni, guides and volunteers. We have learned a lot about people and trees through our mutual experiences. Each staff member has his own knowledge of these interactions which can be shared with the ISA and other interested organizations.

One thing we have learned from our public concerns the idea they have about trees. First, we recognized that one's background has a lot to do with his view of trees. If he is from Kansas he has a different view than someone from New England. If he is a layman concerning trees his view is conditioned or molded by his childhood environment. If he is a professional in the tree world his academic knowledge and practical experience is superimposed on his conditioned childhood experiences, a tempering has occurred.

We find three attitudes about trees which may take numerous subtle and complex forms. First, a percentage of people think of a tree as they would a rock, inanimate, without distinction — a tree is a tree. As sophistication grows they do the same thing but with a refinement — an oak is an oak, a maple is a maple. They also tend to know more about *useful plants,* to classify them with greater refinement, to assign greater value to them than to wild plants.

Second, a percentage of people think of a tree as a living thing but a separate entity, separate from an ecosystem. This is also close to the professional tree practitioner's viewpoint. Trees are then objects for: the matrix of parks, towns, cities, roadways; environmental moderation; use as commodities; real estate enhancement; amenity use, i.e., beautification; wildlife enhancement, e.g., plant packets for attracting birds; hobbies to satisfy the collecting instincts. These people often may not see the forest for the trees.

Third, a percentage of people think of a tree as a component of a natural system, i.e., they do see the forest *and* the trees. They recognize trees as diverse end points of a long "stream of time" going back to the Pteridosperms and Cordaites types of upper Devonian and Carboniferous evolving along certain lines slowly through the ages to the modern woody plants of today. They think of gene pools, mutation, natural selection, plasticity, differentiation and diversity. Trees are a process of evolution of vast complexity and of delicate balance not to be toyed with casually. A tree is not a thing but a living process, age-old and age-less. They think of trees not as static isolated entities but as components of communities which likewise show process: plasticity, differentiation, diversity, complex energy flow, ecotypes, biotypes, *cultivars,* populations of species, succession, and steady state stability. The forest, the community, is the "mother" of trees and must be understood and protected. This is the message we impart to the public at the Morton Arboretum.

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