

# BASIC ECOLOGICAL PRINCIPLES AS RELATED TO POPULATION EXPLOSION<sup>1</sup>

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## ABSTRACT

The serious human problems related to the population explosion are human ecological problems, and their solutions require judicious use of basic ecological principles. Most unfortunately, however, such principles are frequently either unknown, or not utilized, by those in authority within our world societies. A few of these principles are herein discussed, especially as they relate to the establishment of organic communities. The initial establishment of such communities is characterized by stresses so great and varied that death is the rule and survival the exception. A world-wide human community is currently being established and, if man again follows his animal instincts, he will experience death on a scale beyond current imagination. It is therefore proposed that a massive ecological research program be established concerning man of planet earth. Hopefully such a program would provide a sufficient understanding of man that he would develop in a constructive rather than a destructive manner.

## INTRODUCTION

During the past several years—and currently continuing—our news media have been replete with reports relating to the population explosion and environmental pollution. The emphasis placed on these subjects has, and continues to be, timely and sorely needed; however, not infrequently the situations reported are distorted and the corrective measures advocated are biologically unsound, largely due to misunderstanding of, and appreciation for, long-established and well-tested ecological principles. After all, problems faced by our society in regard to these phenomena are clearly ecological problems, for, as pointed out by many such as Wirth (1945), "Whatever else men are, they are also animals, and as such they exhibit the effects of physical aggregation and of their habitat." This point was further elaborated by Hollingshead (1947) when he stated "Ecologists by the nature of their interests are compelled to view man both as an animal in the system of nature and as a part of the sociocultural system he has developed through learning."

It is therefore imperative that biologists, especially ecologists of all vintages, not only increase their efforts in the synthesis of new and applicable ecological principles, but also greatly increase their efforts in the dissemination and elaboration of basic principles currently extant, especially to those of our society in important decision-making positions.

The following discussion concerns a few of the ecological principles relating to the population explosion which the author feels are vital to intelligent action and study concerning the matter, and are presented as related to major components of community formation and development, namely: migration, establishment, aggregation, and reaction. They are further discussed in regard to the author's views concerning corrective measures related to problems associated with the world community dilemma.

## ECOLOGICAL PRINCIPLES AS RELATED TO COMMUNITY FORMATION AND DEVELOPMENT

### *Migration*

The principle that, with sufficiently increased population pressure and/or environmental change, organisms of a given kind have three choices, namely to "adapt, migrate or die," is a case in point. To this principle should be added the corollary principles that organisms have the capacity to reproduce at a geo-

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metrical rate, and that new individuals are transported or move away from the parent into new areas (migration) which may or may not be far distant, and may or may not be (probably not) conducive to establishment. Migration, *per se*, takes place day in and day out throughout all seasons of the year and consequently during all sorts of environmental conditions. It has been instrumental to, but does not completely account for, the spread of biota over our entire world landscape, and assures that any new habitat that may come into being will soon receive representatives of a variety of plants and animals.

The principle of migration also relates to man, who not only has the usual biotic power of geometrical reproduction, but has refined and greatly increased his migrational powers through personal desire and technology. In fact, it appears that some men have become obsessed with the challenge of migration—and migration only—to areas previously uninhabited for the sole purpose of getting there. I understand that certain segments of our technological society feel they have completed their contribution toward getting man on the moon, and are now asking “Where next?”

At the risk of overgeneralization, it is my thesis that man, due to population pressure and its concomitant increased competition, migrated from his original tropical environment into all relatively easily habitable environments of our planet. Human migration is a continuing process and assures that any new habitat will be occupied by some segment of our world society, and that areas already inhabited constantly receive new sociocultural kinds of individuals which may, in time, come to dominate the local society.

#### *Establishment*

Because the landscape is a complex mosaic of different habitats characterized by markedly different environments, migration is usually followed by death, because the environmental complexes impinging upon newly arrived migrants exceed their physiological tolerances. This is especially true of pioneer habitats, i.e. habitats devoid of any amelioration by habitation. Therefore, in relation to establishment of migrants, the following principles should be kept clearly in mind: 1) landscapes are composed of a complex mosaic of habitats, 2) these habitats are characterized by drastically different biological environments which usually exceed the physiological tolerances of the migrants, 3) the end result of most migration is, therefore, death, resulting in 4) natural selection of those biological kinds that are fit.

Due to ramifications associated with the above principles, man, if only animal, would be limited to certain tropical and sub-tropical environments. But man is more than animal. Fortified with the desire and technology to mold natural environments, he established pioneer communities in most of the habitable areas of the world through continuing and fluctuating intensities of migration, followed by a combination of successes and failures in the new environments. Each of the surviving, relatively isolated, scattered world communities prospered, to some degree, and (drawing on ideas developed by certain early American ecologists) each is here considered to have developed as a super- or quasi-organism. These super-organism-like communities remained relatively isolated, until recently, due to geographical, economic, political, and sociocultural considerations, among others.

These principles directly relate to the frequently proposed solution to the population problem of simply creating new habitable space. Buckminster Fuller (1967), for example, proposed the construction of vast spheres to be placed in orbit along with two-by-two-mile tetrahedrons to be floated in the oceans as a major step toward solution of the population explosion. In light of the above-mentioned principles, this idea is frightening and, to me, biologically unacceptable. Even though each of the 300,000 families of a given floating pyramid, which would theoretically support up to one million people, would have an outside balcony,

their only vista would be a monotonous landscape. The internal habitat would most certainly be essentially monolithic and psychologically extreme. What kind of human migrant would survive the environmental stresses associated with such a habitat and population density? What kind of sociocultural community would develop? Might not these floating habitats easily become cultural and/or physical ghettos? And think of the human holocaust which could easily develop with population pressure and/or an environmental catastrophe. As a Texan might say "I'd sure hate to see that bunch stampede?"

#### *Aggregation*

Aggregation is another ecological concept which may be profitably applied to the consideration of the many relatively isolated human communities, each of which is here considered as a quasi-organism, which developed over the world's landscape following migration.

Clements (1938) pointed out, some 30 years ago, that newly established and scattered individuals within a previously uninhabited landscape not only modify their immediate environments, but slowly extend their spheres of environmental influence. This expansion of influences continues until most overlap, thus initiating a community of organisms characterized by competition. The involved organisms are now subjected to a much more complex and usually more rigorous, integrated set of environmental stresses, which is a composite of animate- and inanimate-initiated forces. Clements termed the process of coming together and consequent overlapping of spheres of environmental influence "aggregation." It is my contention that the previously isolated human quasi-organisms of planet earth are today deeply involved in the early phases of this process. More specifically, until relatively recently, most of the societies scattered over our planet were relatively isolated; however, increased severance of economic, political and cultural barriers, greatly expanded communication facilities and their ever-increasing use, and the great impact of the population explosion and its many world-wide ramifications, have initiated aggregation of the previously essentially isolated human quasi-organisms, resulting in the initial formation of a world community.

Many have attested, using a variety of examples, to the current development of a world human community. For example, Buckminster Fuller (1967) stated "I find my work often taking me annually several times around the world with many lesser to-and-froings. This is in no wise a unique record. It is average for ever increasing millions of humans who have responsibilities in the vast frontiers of technology, business, and statecraft of a swiftly emerging spherical world city." He further stated "Quite clearly, a complete transformation of human ecology in universe is occurring. It is not surprising that man, burdened with obsolete 'knowledge'—his spontaneous reflexing conditioned only by past experience, and as yet unable to realize himself as being already a world man—fails to comprehend and cope logically with the birth of Universe Man."

Pioneer plant and animal communities are characterized by severe competition between component members, competition so extreme that many classes of organisms are eliminated. And of those that survive, most are dominated by a few. Is it absurd to postulate that the chances are great that this will also be the fate of the developing world human community? Will the various members of the world community be content to exist in a state of competitive-cooperation? If the world community reacts to aggregation in a fashion similar to plant and animal complexes, the result will be chaos, because environmental stresses will become so great—probably including war and the use of nuclear weapons—that it will simply be a case of survival of the few fittest. As far as natural resources are concerned, with which this symposium was supposed to be primarily concerned, they would be largely obliterated by a nuclear holocaust.

A retort to the above prediction is that man is more than plant and animal and

is imbued with sufficient intellect to learn to live in a condition of competitive-cooperation and prevention of self-destruction. I agree that such intellectual potential exists, but I am pessimistic whether all of the world's societies will develop sufficient intellect and interest in each other's well-being before a world-wide man-made, human catastrophe occurs, brought on by the competitive stresses associated with aggregation.

### *Reaction*

An ecological principle established long ago, and one which could well be referred to as an ecological law, is that organisms, whether plant, animal or human, affect and markedly alter their environments. This effect has long been termed "reaction." In many instances the collective alteration of environmental conditions by the individuals of a given plant and animal community results in the death or disappearance of the causal organisms and their replacement by different kinds of individuals. A powerful and vital human ecological message is included in this principle, but, most unfortunately, the serious human implications associated with this message have not been instilled in the minds of most of our society, due to the failure of those knowledgeable about the implications to give force and clarity to the message and the failure of our apathetic society to give it any significant credence. For example, two days ago a scientist reported additional human deaths directly attributable to polluted environments. I doubt if the serious message of this report had any marked impact on our society.

The world community is being born in effluent environments characterized by ever-increasing air, land, food, and water pollution, and one even mildly serious and knowledgeable concerning the situation cannot help but ponder the ecological impact this situation will have on the structure, behavior, and evolution of the currently developing world community. Those of us who call ourselves ecologists have been negligent in the communication, clarification, and emphasis of the ecological principles associated with reaction; because of their great importance, we should greatly intensify our efforts in this regard.

### THE WORLD COMMUNITY DILEMMA

What are some possible solutions to the world community dilemma currently being developed and intensified by the population explosion and aggregation? Is there any hope that human chaos will be avoided?

In light of basic ecological principles, the current state of human ecological development, i.e. the birth of a world community and concomitant pressures of competition and environmental alteration, presents a situation in which I find little basis for being optimistic as far as man's future welfare is concerned. Because our human population will nearly double in the next 35 years, the competition for survival, prosperity and dignity will no doubt become enormous, and I am fearful that man will retreat to his animal instincts in an attempt to find solutions, and continue to be oblivious to the facts: 1) that he is now a member of a world community, 2) that this community will be subjected to marked increases in competition as aggregation continues, 3) that increased competition will foment new, and intensify currently existing, crises, and 4) that basic ecological principles do help to provide solutions to world community problems. After all, for more than 150 years, man has been largely oblivious to the basic ecological principle that a given habitat can only accommodate a certain number of individuals, even though he daily sees exemplification of this principle in his lawn, roadsides, oldfields, pastures, and parks, as well as in the cramped quarters of his place of employment. Malthus (1798), Darwin (1859), and a host of biologists, especially ecologists, have time and time again pointed out that habitats become filled with individuals within a relatively short period of time. Malthus (e.g. 1798, 1826) pointed out that man could prevent chaos by following preventive measures and that, if he did not do so, natural forces would do so at the expense of human misery. Unfortunately, his

basic ideas were not given sufficient attention to prevent the widespread misery occurring in many places of the world at the present time.

In my judgment, most of the proposed solutions to the population explosion already presented are, in themselves, not the answer, because a well-established and basic ecological principle states that many factors, complexly interrelated, govern the intricate and interwoven forces which control biotic—including human—communities. For example, increasing the world's food supply—and this is becoming more and more difficult—would result in an even more dense world community characterized by even greater competition and friction for prosperity. Creating more habitable space by building huge habitats to float on the oceans or in the air would simply present new landscapes for migration, establishment, and aggregation. In a relatively short time, these would become filled with that segment of our world community allowed and capable of migrating to these areas and fit for such monolithic environments. Decreasing birth rates may help, but our world population will still continue to increase for some time to come, due to advances in controlling disease and extending old-age. It is my belief that it will take all of the above-mentioned approaches, plus many others, to prevent chaos in the not-too-distant future. A massive educational program explaining the relationship of ecological principles to the problems of human relationships in a developing world community is also vital, because most individuals of the human population have little understanding of the intricate and complex interrelationships and interdependencies existing between man and man on planet earth. This is clearly revealed by such frequent statements as "Help them to help themselves."

The fundamental item which makes me pessimistic about our future is that we know so little about the ecology of man, who, collectively, is currently becoming deeply involved in a primary world community and consequently is becoming extremely competitive. Because relatively little is known about the interrelationships between man and man, and man and his environment, will man be able to ascertain proper goals and courses of action without resorting to his animal instincts to solve his problems?

It appears to me that our greatest hope for the future lies in the establishment of a world-wide research and educational program concerning human ecology, which, because of the severity of the problem, should be conducted now and on a crash basis! This program should involve such existing programs as the Family Planning Association, World Council of Churches, UN Food and Agricultural Organization, CARE, and World Meteorological Organization, among others, in association with a world human ecological research program involving teams composed of sociologists, agriculturalists, landscape architects, physicians, geologists, plant and animal ecologists, geographers, political scientists, and representatives of related disciplines. Hopefully a massive human ecological research program would provide such a sufficient understanding of man that his future development might be truly constructive rather than destructive.

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