ECOLOGY AS A FACTOR IN PLANNING FOR OUTDOOR RECREATION

by

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ABSTRACT

The attitude toward the problem of resource utilization at any level is tied philosophically to the man and nature relationship which has developed over a long period of time. Two recurring elements within this theme are, first, the idea that man conquers nature and, second, the common concept of man as something apart, or above, or outside of the rest of the natural world. In North America these ideas, carried to extremes, resulted in a plundering or rape of natural resources. The conservation movement developed as a reaction against such wanton destruction. Among those propounding the conservation ethic were also advocates of national parks and nature reserves.

The park movement received its initial impetus from within the city itself. Its supporters felt that large green spaces should be maintained for the benefit of the urban dwellers living in the burgeoning industrial cities.

The present rapidly expanding demand for outdoor recreation had its beginnings in such a way less than one hundred years ago. Four main factors, all presently increasing are contributing to this demand. They are population, mobility, leisure time, and disposable income. While it is not the only aspect of mobility, the automobile has done much to expand the radius of travel of the prospective recreationist. Since the natural environment is the locale in which the outdoor recreation experience is satisfied it is logical to consider what effect the increased demand is having on it.

It appears that the quality of the recreational experience is to

a large degree dependent on the quality of the environment in which it is fulfilled. A high quality site may deteriorate if too many people frequent it at the same time or over a particular period of time. Ecology is the branch of biological science that is concerned with the relationships of all living things to each other and with the non-living elements of the environment. The understanding of these relationships is a necessary pre-condition to development of any kind. In the narrower context of this study, the proposed hypothesis is that ecology is a basic factor to be considered in planning for outdoor recreation. By outlining some principles and concepts of ecology and relating these specifically to a particular ecosystem; a wetland, the concept of an ecological point of view as a basis for planning has been explained. Supporting evidence, in the form of actual examples, has been drawn upon from a wide range of developments.

The work of three men, Angus Hills, Philip Lewis, and Ian McHarg is also analyzed in respect to their proposed solutions to the problems of resource analysis from an ecologically based approach. William J. Hart has also used this approach in park planning and Artur Glikson utilizes biological information as an intrinsic element of his philosophy of regional planning. One of the first attempts in this field, reviewed here, is that of E. H. Graham who proposed a natural basis for land use.

The hypothesis would largely seem to be substantiated by the evidence presented. Ecological information should certainly be part of the input in the planning process. However, what is clear is that in the past and to a large extent even to-day, this has not been the case. Most of the examples used to illustrate particular points are negative, that is, cases

of ecological information being ignored with the result that a resource was either degraded or destroyed. Few examples have been found to support the positive position.

This study was limited to a review of existing literature. The topic, however, warrants further investigation by either experimental or survey methods or in the review of the historical record of a particular case from the ecological point of view.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

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CHAPTER I

INTRODUCTION

The area to be investigated in this thesis is of increasing general concern as evidenced by its recent appearance in a variety of the modern forms of mass media. The discussion has ranged widely from the level of scientific philosophy to the solving of rather mundane, very specific, local problems. Radio and television have carried panel discussions and documentary specials while in the realm of the printed word, the subject has been covered in varying degrees of completeness, authenticity, objectivity, and outright bias from the daily newspapers and popular magazines to a great variety of scientific and professional journals of every kind and description.

Man is suddenly showing more interest in his environment than he has ever done before. Some authorities claim that this interest has come too late, others maintain that all the controversy and concern is nonsense. What, they ask, is the problem?

One term that has achieved popular usage as the result of this interest is "ecology". Ecology is an area of study within the field of biological or life science. Popularization of the term has led to a subsequent confusion and misunderstanding as to what is the concern of this important science.

The aim of this study is twofold, first, to try to present a general picture of ecological study and, second, to show that it is basic to the planning for outdoor recreation. Ecological information as an input can be applied equally well to planning as a whole, but within the limits of

this study planning for outdoor recreation only will be considered in detail. For purposes of illustration and explanation only one ecological system, or ecosystem, will be discussed, that of a wetland.

Man and the Environment

The present general concern with the environment has taken on a new urgency. However, there is an impressive collection from virtually every era of the past, since written record has been kept, of the thoughts, observations, and warnings of perceptive people of every age about their environment. An article by Clarence Glacken, concerning this historical record, illustrated the richness of the past, the scope of the observations, and how their importance is viewed over time. He states:

> In looking back on the past, it seems that the thinkers of ancient and early modern times saw only the changes that appeared in localities known to them, that those of the eighteenth century realized these changes were world wide, and that the thinkers of the nineteenth recognized both their extent and their cumulative effect, while contemporary thinkers are impressed with the acceleration of change as a consequence of population growth and technological advance.[1]

The European writers in this area are legion, coming from philosophy, history, science and technology. In America, the first real foray of any consequence in this area was that of George Perkins Marsh whose book, Man and Nature; or Physical Geography as Modified by Human Action, was published in 1864. This was largely based on evidence gathered in Europe and the Near East where Marsh spent some time as a representative of the American Government. It is

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[1] C. Glacken, "Changing Ideas of the Habitable World," Man's Role in Changing the Face of the Earth, ed. W.L. Thomas Jr., (Chicago: University of Chicago Press, 1956), p. 88.

interesting to note that in 1864, this man could pose the following questions.

> Many circumstances conspire to invest with great present interest the questions; how far man can permanently modify and ameliorate those physical conditions of terrestrial surface and climate on which his material welfare depends; how far he can compensate, arrest, or retard the deterioration which many of his agricultural and industrial processes tend to produce; and how far he can restore fertility and salubrity to soils which his follies or his crimes have made barren or pestilential.[2]

Certainly the modern science of ecology is foreshadowed in this following quotation:

> Apart from the hostile influence of man, the organic and inorganic world are, as I have remarked, bound together by such mutual relations and adaptations as secure, if not the absolute permanence and equilibrium of both, a long continuance of the established conditions of each at any given time and place, or at least, a very slow and gradual succession of changes in those conditions.[3]

Marsh is often credited with the initiation, in America, of what is called the "conservation movement". This was really a plea for management of resources which, at that time, in the United States, were being plundered. He was followed very soon by four other men of stature, on the American scene, Carl Schurz, John Wesley Powell, John Muir and Gifford Pinchot. Of the four, Pinchot and Muir are probably best known, for it was the work of Pinchot which led to the founding of the National Forests and the whole concept of forest management. Muir was noted for his eloquent writings on behalf of "preservation" and the National Park Movement.

But these were extraordinary men and they were not all representative of their age. The prevailing attitude had essentially two aspects,

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[2] G.P. Marsh, Man and Nature; or Physical Geography as Modified by Human Action, ed. D. Lowenthal (Cambridge, Mass.: Belknap Press of Harvard University Press, 1965, originally published 1864), p. 28.

[3] Ibid., p. 36.

first, that the world was man's oyster--there for his taking and, second, the philosophy that developed around the concept of man conquering or subduing nature. In both of these aspects man puts himself above and outside the rest of nature and does not seem to recognize any responsibility toward the natural world.

Man as a Disruptive Force

In the book, Biogeography: An Ecological Perspective, Dansereau speaks of the "scale of human interference".[4] This, he says has developed in six successive stages which are: gathering, hunting, herding, agriculture, industry and urbanization. The Amazonian tribe, used as an example of gathering, conflicts very little, if at all, with its environment. It's members change little in the environment and have changed little themselves over hundreds of years. At the other end of the scale is urbanization which "is the ultimate replacement of all natural elements (soil, hydrologic system, vegetation and fauna) by man-made ones; roadway, sewage network, lighting and heating apparatus, living and working constructions."[5]

The city has an undeniably great place in the history of man. Man has been building cities for thousands of years. But it is important to remember that they are man-made, artificial structures, and therefore subject to human error--errors of situation, design, construction and use. Many cities of the past have been destroyed by natural catastrophes or as the result of human conflict. Cities have also been destroyed through unconscious acts perpetrated against nature. Others exist in subnormal

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[4]Pierre Dansereau, Biogeography: An Ecological Perspective (New York: Ronald Press, 1959), p. 264.

[5]Ibid., p. 263.

condition forcing many of their inhabitants to live in an ever deteriorating environment. The automobile seems to have accentuated this trend, but it has also allowed many people, particularly in North America, to flee the city, and thus separate themselves further than ever from their place of work and spend more time in transit to and from their home. The attitude seemed to be, that the city was necessary as a place of work but, if possible, man should live elsewhere.

Artur Glikson views townbuilding as "the creation of a new ecological system of social interaction."[6] He expresses the need for man to recognize his power in changing the natural environment and the fact that biological information is so often neglected in the process of instituting change.

> But at the same time, life in the new environmental structure becomes a matter of precarious balance. Only a step divides urban-rural mutuality from exploitation, surplus productivity from soil-exhaustion, inter-regional contacts from war, the function of the town as a co-ordinating and distribution organ from that of a parasite.[7]

Man must recognize first, understand second, and then act in a positive way. Though he is the dominant force he is also, like the rest of the animal kingdom, still dependent on the plant kingdom for survival. How much of the vegetal variety can he destroy and replace with "agronomic flora"[8] before the scale can no longer be balanced?

Robert Arvill asks, "So, what is the outlook for the future?

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[6]Artur Glikson, "Man's Relationship to His Environment," Man and His Environment, ed. G. Wolstenholme (Boston: Little Brown & Co., 1963), p. 136.

[7]Ibid., p. 136.

[8]Aldo Leopold, A Sand Country Almanac (New York: Oxford University Press, 1949), p. 194.

What is the lesson to be learnt about the impact of man's demands for food, shelter, power and mobility? It is that the natural environment can no longer survive without positive action to conserve it."[9]

The Balance

Occasionally, the disruptiveness of man's action is brought home to him by nature's reaction to it. Even then it is but a secondary effect since his primary concern is the economic loss involved. Leopold records the results of the wholesale killing of predators, deemed necessary by some. Unfortunately the prey species then swiftly increased in numbers and overgrazed their feeding grounds.[10] Sears records the results of a massive investment in a highly technical manufacturing plant built on a flood plain. A flood followed shortly after resulting in an unfortunately large economic loss.[11] Douglas presents a vivid portrait of the pollution of some of America's rivers, in particular the Mississippi.[12] The list of errors is almost endless, but, until they involve an economic loss, little is done. This attitude is presently undergoing change with the massive problem of pollution in air, land, and especially water, being felt across the country. The unfortunate part about it is that some communities will not benefit from the new concern as the damage has already been done. It is odd, however, that environmental study, preservation and manipulation is forced to await

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[9]Robert Arvill, Man and Environment (Harmondsworth: Penguin Books Ltd., 1967), p. 20.

[10]Leopold, op. cit.

[11]Paul A. Sears, The Living Landscape (New York: Basic Books, 1966), p. 122.

[12]William O. Douglas, A Wilderness Bill of Rights (Boston: Little Brown & Co., 1965), p.

the awakening of the economic machine.

The Study

The problems described herein are really universal, affecting the biosphere as a whole. One small area, which, with all other areas, is affected by the acts of man and, paradoxically, is dependent on the quality or naturalness of the environment for its appeal is outdoor recreation. Generally this is, in the context used here, limited to non-urban outdoor recreation. A phrase oft times used by the general public as descriptive of what they like about it is "the scenery".

But why do we have to plan for outdoor recreation? Until about fifty years ago, not much thought was given to this idea at all. The radius of activity of the average man was short since there were no automobiles and only the wealthy would travel for recreational purposes. The land stretched far and wide once the city's boundaries were passed. Indeed the bulk of the settled land was still rural in character. The work day was long and vacations generally unknown. To-day these situations are reversed. There is general automobile ownership (75 million in the U.S. in 1961)[13] and highways make virtually every nook and cranny of the continent accessible. Over two thirds of the population now live in areas classified as urban. The land no longer stretches far and wide, much is alienated or falls within the ever widening circles called Metropolitan Statistical Areas. It is competed for by thousands of agencies both public and private, each of whom consider their particular usage the most important and necessary to the nation's economy.

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[13]Douglas, op. cit., p. 23.

All of these uses must be co-ordinated and the use of the allotment of each must be carefully planned.

The basis for non-urban outdoor recreation is the natural environment. Hence it is understandable that planning is going to have to be carried out to meet the pressures of an increasingly urbanized society. These pressures infringe very greatly on the maintenance and quality of the natural environment. Ecology, then, which seeks to understand the relationship between the biotic and the abiotic environment, would seem to be central to this planning process. Unfortunately it has not been and even to-day does not receive the attention in the way of research and implementation that it deserves.

This paper will show the inter-relationships and interdependencies between outdoor recreation, ecology and planning. It is primarily concerned with the North American context, though other data will be used where applicable. The study is limited to research of existing information in recreation, ecology and planning. No experiments, surveys or other investigational techniques have been employed due to limitations of time and the nature of the subject under investigation. Definitions of scientific, special, or unusual terms will either be discussed in the text of the appropriate section or be footnoted the first time they appear.

Hypothesis

The hypothesis put forth here is that ecology is a basic factor to be considered in planning for outdoor recreation. In this context, ecology is used in its broadest sense, encompassing what might also be called "biological information", information which would then stand along

side of physical, social, and economic data as an input in the planning process. To date the physical and economic information have received emphasis to some extent because they were readily available, but also because they were considered to be of more importance. With increasing interest in environmental quality and improved biological methodology the availability and use of such information should increase.

Organization

The study's three main elements will be handled in the following order. Chapter II will deal with recreation. A brief historical sketch is followed by discussion of such factors as mobility, age structure, income and increased leisure time. Attention will then be focused on non-urban outdoor recreation in particular. Chapter III considers ecology from its historical beginnings to a discussion of principles, concepts and application. Included at this time will be the description of the ecology of a wetland. Chapter IV will synthesize Chapters II and III through the process of planning for outdoor recreation. This chapter will be followed by a short summary and conclusion.

CHAPTER II

RECREATION

This chapter seeks to investigate the whole broad area encompassed by the term "recreation". Confusion surrounds the use of this term and the associated terms "leisure" and "play" on both the popular and academic levels. A portion of this chapter will be devoted to the difficult issue of formulating acceptable standard definitions. The initial observable dichotomy with reference to "recreation" is that on one hand it is regarded as an activity or a group of activities and on the other as an attitude or "set of feelings".[1] Much effort has been expended in trying to resolve these difficulties of definition which inevitably lead to problems of communication and misunderstanding.

Two activities widely played for pleasure, tennis and golf, now have professional counterparts. To the men and women involved, these are no longer activities to be engaged in during free time but are their means of earning a living. There are also professional hunting and fishing guides and individuals who operate charter services for fishing craft, yachts and other recreational services. The range of pursuits, both active and passive, available to the public to-day is countless and new ones are constantly being added. Some of these enjoy sudden "booms" and whole new sets of regulations, some woefully inadequate, must be quickly developed to cope with them. Two such recent examples might be water skiing and the current winter sport, "ski-dooing".

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[1]Norman P. Miller and Duane M. Robinson, The Leisure Age (Belmont, California: Wadsworth Publishing Co., 1963), p. 7.

Many of the so-called amateurs in various fields, such as ornithology, botany or astronomy, have contributed to the wealth of human knowledge through discovery of some previously unknown phenomena. Some activities not only require the acquisition of scientific knowledge but also the development of technological and physical skills. For example, a spelunker may also be a lapidary and hence meet the requirements of the above category. He would require many of the physical skills of a mountain climber in exploring the caves and would also need scientific knowledge of geology and mineralogy in order to obtain the specimens which, with his special technological skill, he could then cut and polish. Such an undertaking could quite conceivably satisfy what Dumazedier calls "the three functions of leisure",[2] relaxation, entertainment and personal development.

The one characteristic which is common to the above examples is that of their voluntary nature. They are embarked upon freely and under no compulsion. This particular aspect will be discussed further as part of the section on definitions.

Free Time, Leisure, Recreation, and Play

The broad subject of recreation enjoyed its first period of active academic interest, on this continent, during the thirties. This was followed by a long period of sporadic activity until the late fifties when interest was revived. Much of the writing concerns the problem of terminology and also the statement of work and leisure as opposites. The former will be

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[2] J. Dumazedier, Toward a Society of Leisure (New York: The Free Press, 1967), p. 14.

discussed now, while the latter will receive consideration presently.

"Free time", or as some authors prefer to call it, discretionary time, is that portion of our daily twenty-four hour allotment remaining when the hours of sleep, work and general "house-keeping"[3] have been subtracted. The length of the day is the same for everyone. However, the disposition of it over the four categories stated above is apt to vary greatly. Not everyone requires the same amount of sleep or spends the same amount of time over meals or works the same number of hours in a day. It follows, then, that free time represents a broad range which may be a function of such things as socio-economic status, education, type of work and its location in respect to place of residence, and others. These factors in turn will affect the very nature of the free time, that is, the period during the twenty-four hours at which it occurs and whether this be in the form of a block or small portions interspersed with other activities.

The use to which this free time can be put will be greatly affected by all of the above mentioned conditions. Certainly a person who regularly works a night shift must develop a regimen completely different from that of the normal nine-to-five employee. The choice of activities in which to participate would also undoubtedly be more limited for him. The rotating shift presents a similar problem in that the free time may occur during a period of the day which an individual may find is not suitable to him.

Free time, therefore, varies not only in extent but also in disposition and, in terms of the individual, may be rated at a premium or

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[3]The term is used here as a collective expression to encompass a wide variety of necessary activities performed daily.

of little value depending on what he wishes to do with it and how the above limitations affect it.

"Leisure", according to Miller and Robinson is "the complex of self-fulfilling and self-enriching values achieved by the individual as he uses leisure time in self-chosen activities that recreate him".[4] They distinguish between "leisure" and "leisure time", the latter being "that portion of available free time devoted to the pursuit of leisure values".[5] Dr. Miller stressed this point at the 45th National Recreation Congress during a discussion involving himself, Robert Theobold, Paul Haun and Charles K. Brightbill. It is interesting to note that he was the only one to make such a distinction. This particular term is probably the most controversial, most confused and least crystallized.

De Grazia points out that leisure is frequently equated with free time and hence "thought of as the opposite of work".[6] He goes on, "anybody can have free time. Not everybody can have leisure....Leisure refers to a state of being, a condition of man, which few desire and fewer achieve."[7]

The French sociologist, Dumazedier, presents a slightly different view again. "Leisure is activity - apart from the obligation of work, family, and society - to which the individual turns at will, for either relaxation, diversion, or broadening his knowledge and his spontaneous social participa-

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[4]Miller and Robinson, op. cit., p. 6.

[5]Ibid.

[6]S. de Grazia, Of Time, Work and Leisure (Garden City, N.Y.: The Twentieth Century Fund Inc., 1962), (Anchor Books edition, 1964), p. 4.

[7]Ibid., p. 5.

tion, the free exercise of his creative capacity."[8]

Undoubtedly this is an area in great need of clarification. To that end a survey of several sociological journals was carried out, covering the period from 1962 to the present. Little evidence was found to indicate a contemporary interest or concern with this area. Indeed, Giddens maintains that the study of leisure is "one of the neglected fields of sociology".[9] He also expresses the opinion that the approach to the subject of leisure in sociology has been in "terms of a polar contrast to work".[10] Giddens, like de Grazia, feels that this has led to leisure being considered trivial or not worthy of study and to the "conceptual confusion and ambiguity in the use of the key terms 'leisure', 'play' and 'recreation'."[11] Regardless of the confusion it is an important concept and one which most authors feel is tied directly to industrial society in its development. Leisure has expanded concurrently along with technological innovation and industrialization.

For purposes of further discussion within this thesis the definition of Miller and Robinson will be adopted.

"Recreation"has faired somewhat better than the other terms considered so far. There are differences, but basically all of the definitions specify similar attributes and it is only a matter of degree which

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[8] Dumazedier, op. cit., p. 16-17.

[9] A. Giddens, "Notes on the Concepts of Play and Leisure", Sociological Review, XII, 1964, p. 83.

[10] Ibid., p. 81.

[11] Ibid.

separates them. Three cases will serve to illustrate this point.

Clawson and Knetsch state their case very simply, as follows; Recreation "is the activity or activities (including inactivity if freely chosen) engaged in during leisure time."[12] They lay the stress on the activity itself and the factors, such as age and sex, which may exert considerable influence, along with physical, economic and social conditions, over the choice of these activities.

The definition of Doell and Fitzgerald is broader and perhaps more philosophical in nature. To them recreation "is the natural expression of certain human interests and needs seeking satisfaction chiefly during leisure."[13] They identify two primary needs: survival needs and personality or developmental needs, and go on to explain that recreation is more closely related to the latter.[14] Two related concepts which are in themselves adjuncts to this particular line of thought can be explained at this point. The first is that recreation can be "recreative" that is, it can fulfill the role of "repairing the wear and tear inflicted by the ordinary routine of life";[15] this is the so-called "relaxation" theory. Or, second, there is the idea that it serves a "creative" function allowing the individual to experience and express values and talents not found in other human activity.

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[12]Marion Clawson and Jack Knetsch, The Economics of Outdoor Recreation (Baltimore: John Hopkins Press, 1966), p. 27.

[13]C.E. Doell and G.B. Fitzgerald, A Brief History of Parks and Recreation in the United States (Chicago: The Athletic Institute, 1954), p. 127.

[14]Ibid.

[15]C.G. Wrenn and D.L. Harley, Time on Their Hands (Washington: American Council of Education, 1941), p. 15.

Thus, recreational activities are not confined to participation in sports, hobbies or cultural pursuits but may involve voluntary aid to other persons or groups of people who benefit from such service. Such an act may be truly "re-creative" for the volunteer worker involved, in that he achieves a sense of satisfaction and enjoyment from doing it. There is personal gain, but it is not of an economic nature.

Miller and Robinson expand their definition of recreation even further. Recreation, they say, "is the process of engaging in activities during leisure time, with a set of attitudes that makes possible the attainment of leisure values."[16] In emphasizing the process over the activity, they represent the opposite pole from that expressed by Clawson and Knetsch. However, the breach is not as serious as in the case of leisure.

"Play" is not a term is common usage to-day for, popularly, it has connotations only of the activities of children. In fact, it predates most of the above terms in its application to the topic under discussion. A review of the historical developments and their modern counterparts is presented by Sapora and Mitchell in, The Theory of Play and Recreation, a work referred to by Giddens. One of the earliest theories, the surplus energy theory, was put forth by Fredrick Schiller late in the eighteenth century. Simply stated, this meant that play was just a means of utilizing energy not consumed in other life processes. Other theories followed in the nineteenth and twentieth century: the recreation theory; the recapitulation theory and the instinct-practice theory. Giddens noted that early educational theory "viewed play in an unfavourable light as a 'wasteful

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[16]Miller and Robinson, op. cit., p. 7.

activity'."[17]

Some of the modern approaches have been through the work of psychology and psychoanalysis. Giddens reports Freud's description of play as serving a "cathartic function", that is, acting in the discharge of emotional tension and frustration and Claparede's statement that it allows for the expression of ego and the display of personality.[18]

This attitude may be summed up by one of Dr. Paul Haun's remarks at the 45th National Recreation Congress. "Play, it seems to me, is a primary biologic activity, an elementary need, comparable in a general way to the need for food, sleep and air to breathe."[19] There is also the pervading feeling that play is comprised of such elements as fun or gaiety, spontaneity and naturalness.

These definitions are bound to change in the light of further research and changing attitudes. But it is necessary to clarify the present situation as much as possible in order to avoid confusion of terminology and misunderstanding of intent.

Historical Sketch of Recreation in North America

The first city park in the United States was Boston Common which was established in 1634. This was really part of the European tradition and admittedly its original function was not recreation. Some American cities

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[17] Giddens, op. cit., p.m 78.

[18] Ibid.

[19] 45th National Recreation Congress, Leisure the Heart of Living (St. Louis, Missouri: 1963), p. 13.

of Spanish origin had a square or plaza for public use. Other early examples of the concern for public open space within the city are William Penn's treatment of Philadelphia in 1682 and L'Enfants' plan for Washington D.C. in 1792. These are somewhat isolated examples, however, in that general concern in this area did not take place until about the middle of the nineteenth century.

This stage is perhaps best marked by the development of Central Park in New York City in 1853 under the guiding hand of Fredrick Law Olmstead, who later was one of the major forces behind the establishment of the Yosemite Grant. It is interesting to note that the Central Park issue received its initial stimulus from a group of interested citizens and that the land was designated specifically for park purposes. The program grew very quickly from this time on:

> By 1877 about twenty cities had established parks, by 1892 the number of cities having such areas had increased to one hundred, and in 1902 positive steps had been taken along that line by nearly eight hundred municipalities.[20]

It is from these beginnings that the vast system of both indoor and outdoor recreational facilities in use to-day, has developed.

The Yosemite Grant was made in 1864, giving to the state of California a portion of what is now Yosemite National Park. The first link in the National Park chain was forged in 1872 with the designation of Yellowstone National Park. By 1957 the National Park Service of the United States administered over one hundred seventy-five separate areas representing almost twenty three million acres of land. These are not

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[20] C. Frank Brockman, Recreational Use of Wildlands (New York: McGraw-Hill, 1959, p. 51.

Table 1

Summary of Areas Administered by the National Park Service,
January 1, 1960

Type of area	Number	Federal land (acres)	Lands within exterior boundaries not federally owned (acres)	Total lands within exterior boundaries (acres)
National Parks	29	13,205,071.01	250,307.45	13,455,378.46
Nat. Historical Parks	7	31,841.66	5,359.87	37,201.53
Nat. Monuments	83	8,984,449.45	145,087.79	9,129,537.24
Nat. Military Parks	12	26,324.71	2,383.57	28,708.28
Nat. Memorial Park	1	68,708.36	1,665.94	70,374.30
Nat. Battlefield Parks	3	5,318.07	2,170.03	7,488.10
Nat. Battlefield Sites	5	188.63	547.35	735.98
Nat. Hitoric Sites	12	1,491.40	2.12	1,493.52
Nat. Memorials	13	4,447.96	152.00	4,599.96
Nat. Cemeteries	10	215.10	5.00	220.10
Nat. Seashore Recreational Area	1	24,705.23	3,794.77	28,500.00
Nat. Parkways	3	91,429.72	21,458.44	112,888.16
Nat. Capital Parks[1]	1	39,503.53	1,444.00	40,947.53
Total, Nat. Park System	180	22,483,694.83	434,378.33	22,918,073.16
Other Areas				
Nat. Recreation Areas	3	2,013,768.00	54,900.00	2,068,668.00
Grand Total	183	24,497,462.83	489,278.33	24,986,741.16

[1] Includes Catoctin Park, Chesapeake and Ohio Canal, Prince William Forest Park, Baltimore-Washington Parkway, Suitland Parkway among the 780 units administered.

(Source; Ise, Our National Park Policy, p.2.)

all parks but include historic parks, monuments, memorials, parkways and others (see Table 1).

In Canada the national system was started in 1885 with the founding, by statute, of Banff National Park. This was quickly followed by the establishment of Glacier and Yoho National Parks in 1886. Since that time some fifteen others have been added and more have been proposed.

The whole elaborate structure is hardly more than one hundred years old. Yet, at the national level, these two North American systems predate their counterparts in most other countries. To-day, there is concern that some of the parks are suffering from over use. The number of visitors continues to increase yearly as population, interest, and free time also rise. One of the most important questions yet to be answered is - how are these people to be accommodated without destroying the natural qualities and beauty the park concept originally sought to preserve.

Supply

As was stated earlier, raw natural landscape, that is, land and water, is the resource on which all outdoor recreation is based. Both land and water are present in a variety of forms and the use to which they can be put is largely dependent on their form. This also conditions to a great extent what kind of development will occur. Recreation competes with other land uses for a share of the total. The result is that a variety of land parcels ranging in size from the very small children's playground to the vast national park or reserve are devoted to recreation. These areas can be considered to be single use areas in that they are designed for and primarily function as areas of recreational

use. But recreation cannot be confined to them and hence must share the remaining land and water with other uses, many of which are single use categories. Conflicts arise from this situation causing argument as to which particular use should have priority.

One innovation which attempts to ensure enough park space for everyone, is the standard, such as that of ten acres per thousand people for city parks, adopted by the National Recreation Council of the United States. But the standard is only part of the story; location, degree and type of development are not usually taken into account by it. As densities increase it may become physically impossible to apply the standard.

Another common misconception is that there is plenty of space available for recreation. Not every mountain is suitable for skiing, nor every beach for swimming. The number of times on a given coastline that correct slope, sand and suitable water temperature coincide may be few indeed. If such a site were developed for industry, then the recreational activity must be fulfilled on one of lower quality.

Some areas to-day are being over used, others not used to capacity. Perhaps some of the overuse is the result of not providing alternative spaces for a particular activity, the rest is probably due to sheer increased demand.

Demand

It has been established that there is a basic human need for respite or repose through recreational activity. What then, are some of the factors which contribute to increasing demand for recreation? The Outdoor Recreation Resources Review Commission Study[21] considered the

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[21] U.S. ORRRC, Participation in Outdoor Recreation: Factors Affecting Demand Among American Adults (Study Report No. 20, Washington: G.P.O., 1962).

following eight factors: age, income, education, occupation, residence, mobility, opportunity for activity and natural character. Clawson and Knetsch,[22] described population, leisure, transportation and income as the four main factors. Brockman[23] uses population, leisure and transportation. Arvill,[24] in a discussion of the British situation, considers population, free time, money, mobility and inclination.

Population, free time, income and mobility seem to be common to all of the above studies and perhaps on that basis can be considered to be the main factors. Population is the only one that can be considered independently. The other three definitely interact and reinforce each other.

There are three important elements that must be considered in any discussion of population with respect to recreation. These are the general increase, the changing urban-rural ratio and the age structure. The population of the United States at the time of the first census, in 1790, was less than four million. In the fall of 1967 it had reached two hundred million. The annual rate of growth declined from approximately three percent in the first half of the nineteenth century to about one half percent during the depression era of the 1930's. To-day, it has reached an annual rate of increase of almost one and three quarters percent. In Canada the population stood at just over five and one third

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[22]Clawson and Knetsch, op. cit., p. 93 ff

[23]Brockman, op. cit., p. 12 ff

[24]Robert Arvill, Man and Environment (Harmondsworth: Pelican Original, 1967), p. 72 ff.

million in 1901 and by 1961 had reached more than eighteen million.

What of the future? Clawson and Knetsch put it this way, "Every demographer, economist, sociologist, or other student of population changes expects the United States to have a substantially larger total population in the decades ahead."[25]

The changing urban-rural ratio is considered to be of particular importance as far as participation in outdoor recreation is concerned. It may well be one of the main factors contributing to the increase in this area.

In 1790 five percent of the American population was urban and ninety-five percent rural. By 1950, fifty-nine percent was urban and forty-one percent rural. Even if consideration is given to problems of definition of terms and census designations, there is still a very significant reorientation towards the urban situation. Some projections indicate this trend will continue and by the year 2000, eighty to eighty-five percent of the population will be urban.[26]

Canada is experiencing a similar trend. In 1901 the population was thirty-five percent urban and sixty-five percent rural. By 1961 the situation had completely reversed, seventy-one percent being urban and twenty-nine percent rural. Another interesting observation also related to this urbanizing trend is the changing nature of many occupations away from the active outdoor category to the relatively sedentary indoor type. This too, may be another reason for the appeal of outdoor recreation.

Age distribution is of importance because of the changing interests of people as their age increases. Participation in active sports

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[25]Clawson and Knetsch, op. cit., p. 94.

[26]Ibid.

usually declines with increasing age. As the number of people in the different age distribution categories varies, the requirements for specific facilities are also affected. The general trend recognizable in North America to-day is one of increases at each end of the scale. The percentage increase in young people has been particularly noticeable since the end of World War II. On the other hand, there have been steady increases in the percent of the population over forty-five since 1890 according to U.S. statistics.

While population is more independent than free time, income or mobility there is a certain amount of overlap and inter-relationship as evidenced by the effects of the urban-rural ratio. Free time has been described as the amount remaining after hours of work, sleep and "housekeeping" have been subtracted. Some investigators equate free or discretionary time with leisure. This assumption has not been accepted here. Most would accept the idea that recreation forms only a part of leisure time.

The whole concept of time is a subject for study and analysis in itself. Time has a paramount place in society to-day. There are discrete hours of work, hourly pay rates, schedules for a great range of activities from air and shipping lines, concerts and football games, to hours of worship and education, all neatly arranged and co-ordinated by the clock. This point is brought out in the summary of a chapter devoted to time in the book Work and Leisure by Nels Anderson.

> Perhaps never in human existence has it been so necessary for man to be so time conscious as Westerners are to-day. Man marked the seasons as they came and went and he counted the years,

> but he had no need of a watch for dividing time into tiny fractions. Western man not only counts time in tiny fractions but he measures hours and minutes against money much as he measures goods and services against money.[27]

One method of studying how time is used is in the compilation of what is called a "time-budget". According to Alexander Szalai "the original time-budget study was concerned with the daily life of Moscow workers and the data were gathered by the Nestor of Soviet economic planning, Professor S.G. Strumlin".[28] This study, done in 1924, formed the basis for a comparative one carried out in 1959 by Professor G.A. Prudensky (see Table 2). It differs from some of the ones in use to-day in that it is expressed for individuals in terms of a twenty-four hour period whereas the latter are for the nation in terms of a year.

In a study by Mary A. Holman "it was assumed that all time not consumed by sleep and personal chores was leisure."[29] On this basis she determined that between 1900 and 1950 daily leisure increased one hundred fifty percent, week-end leisure, two hundred fifty percent and vacation leisure, two hundred percent. For the period 1950 to 2000, the projected figures were one hundred percent, two hundred seventy percent and four hundred percent respectively (see Table 3). In 1900 there was a sixty-hour work week, a ten-hour day and there were virtually no annual vacations. By 1950 there was a forty-hour work week, an eight

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[27] Nels Anderson, Work and Leisure (London: Routledge and Kegan Paul, 1961), p. 73.

[28] Alexander Szalai, "Trends in Comparative Time Budget Research", Ekistics, Vol. 24, No. 144. (Nov., 1967), p. 385.

[29] Mary A. Holman, "A National Time-Budget for the Year 2000" in Sociology and Social Research, Vol. 46 (1961), p. 24.

Table 2

Time Table for the Working Day for Urban Workers in the Soviet Union, According to Time Budgets in Hours

Time expenditure	1924		1959	
Time not at own disposal	men	women	men	women
I. Productive work for the community (with overtime)	7.83	7.64	7.17	7.20
private	0.45	0.57	0.78	0.62
total	8.28	8.21	7.95	7.82
II. Housework (in the family) preparation of meals	0.48	2.56	0.23	1.41
care of children	0.16	0.53	0.43	0.65
other	1.08	1.71	1.04	1.85
total	1.72	4.80	1,70	3.91
III. Lost time to and from the place of work	0.95	0.86	1,93	1.30
shopping and waiting in queues	0.22	0.20	0.37	0.65
total	1.17	1.06	2.30	1.95
total of time spent for indispensible activities (I-III total)	11.17	14.07	11.95	13.68
IV. Indispensible necessities meals on the job and at home	1.55	1.27	1.18	0.93
sleep at night and during the day	7.74	6.83	7.48	6.97
total	9.29	8.10	8.66	7.90
(I-IV total)	20.46	22.17	20.16	21.58
Time at own disposal study and individual cultural activity	1.86	0.68	1.68	1.15
recreation and entertainment	1,68	1.15	1.71	1.27
total	3.54	1.83	3.39	2.42
percentage of time fund	14.7%	7.6%	14.1%	10.1%
total hours per day (sum of the budget)	24	24	24	24

(Source; Szalai, Ekistics ,November,1967 , p. 385)

Table 3

Time Required for Nondiscretionary Activities and Discretionary Time

Item	Billions of hours, annually 1900	1950	2000
Population with 24 hours	667	1329	2907
Nondiscretionary time			
Sleep	265	514	1131
Personal care	37	74	164
Work	86	132	206
Housekeeping	61	68	93
School	11	32	90
Under 5 years, nonsleeping hours	30	56	110
Total nondiscretionary time	490	876	1794
Discretionary time			
Daily leisure			
Labor force and housewives	61	159	287
School population	11	30	88
Week-end leisure			
Labor force and housewives	35	143	379
School population	15	36	104
Vacation leisure			
Labor force and housewives	0	7	99
School population	17	28	83
Retired	6	24	56
Other[1]	32	26	16
Total discretionary time	177	453	1112

[1] Includes children between 5 and 13 not in school.

(Source; Holman, Table I, p. 19)

hour day and on the average, a one week annual vacation. "In the year 2000, the estimated twelve hours a week increase in discretionary time could be equally allocated between a shorter work day, fewer days worked each week, and an extended vacation."[30]

There seems to be little doubt that the amount of free time is increasing. But the distribution of it over the day, week, month or year is changing, so that the form in which it appears in the future will be considerably different from to-day. This may be, for instance, as a three day week-end. What effect would this have on the recreational facilities of any given area?

Mobility is not just the result of an increase in the number of registered automobiles. Rather it is the increased ability of the population at large to make use of various modes of travel more easily and more economically. Consequently distance becomes much less of a barrier to recreational travel. Attractions now thought remote become available to the average man and his family. Air travel is expected to increase in the United States from thirty billion passenger miles in 1960 to one hundred fifty billion in 1967.[31] Airlines have made off-season economy fares more available along with reduced fares for students and various group organizations. Club or group charter flights are more frequent. There is also the possibility, already in evidence to a limited degree, of using air travel to cover major distances and of hiring automobiles at the destination.

The numbers of automobiles is also expected to increase and the continent wide highway system will inevitably expand to meet this

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[30]Ibid., p. 30.

[31]U.S. ORRRC, Outdoor Recreations for America,(Washington: G.P.O., 1962), p. 31.

pressure. In 1966, driving for pleasure was still rated the most popular outdoor recreation activity.[32] The National Park Service of the United States has been involved in the development of parkways since 1933. They are described as "a federally owned, elongated park featuring a road designed for pleasure travel, and embracing scenic, recreational or historic features of national significance."[33]

Another aspect of mobility is its effect on travel between countries, not only from North America to other parts of the world but from other parts of the world to North America.

Future prospects are for a larger population with greater mobility and much more free time.

The fourth and last of the factors affecting demand for recreation to be considered here is income. It is predicted that the gross national product of the United States will continue to rise. However, the National Planning Association issues this warning:

> A larger G.N.P. does not necessarily reflect a better world or even greater efficiency in the operation of our economic system. Such value judgements must take into consideration more detailed information on family consumption levels, distribution of income, hours of work, use of leisure and on the kind of Government services which are contained in the G.N.P. estimates.[34]

The expected rate of increase is three and one half percent annually. Coupled with this, the real income per capita is considered to be increasing by about two percent annually.

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[32]Eldridge Lovelace, "The Automobile and Recreation", Traffic Quarterly, (October 1966), p. 530.

[33]Clermont H. Lee, "Landscape Integration in Road Design", Landscape and Human Life, ed. C.R.V. Tandy, (Amsterdam: Djambatan Publishers and Cartographers, 1966), p. 83.

[34]U.S. ORRRC Economic Projections for the Years 1976 and 2000 (Study Report No. 23, Washington: G.P.O., 1962), p. 130.

Approximately five to six percent of personal disposable income is presently spent for recreation, according to 1956 statistics. This is expected to rise in response to the other two trends noted above.

There are very difficult problems to be overcome in the categorization and estimations of recreation spending. This is illustrated by the fact that "there is little agreement as to the definition of recreation as far as expenditures are concerned. The basic difficulty is that recreation is a purpose of expenditure, rather than a kind of expenditure."[35]

Though this is a difficult area to quantify accurately, there is no doubt of its importance to participation in recreation as a whole, and outdoor recreation in particular. To purchase an automobile or airline ticket requires a certain monetary outlay. Some forms of outdoor recreation, such as camping, skiing or skin diving, can entail considerable capital expenditure, on the part of an individual, for equipment. The question of participation in such activities is, at least partly, related to income.

The four factors under discussion in this section are of paramount importance in understanding the phenomenal increase in demand for recreation. They are not the only factors, but at present, they seem the most critical.

Five Outdoor Recreation Activities on the Increase

Driving for pleasure has already been mentioned as an area of

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[35]Clawson and Knetsch, op. cit., p. 103.

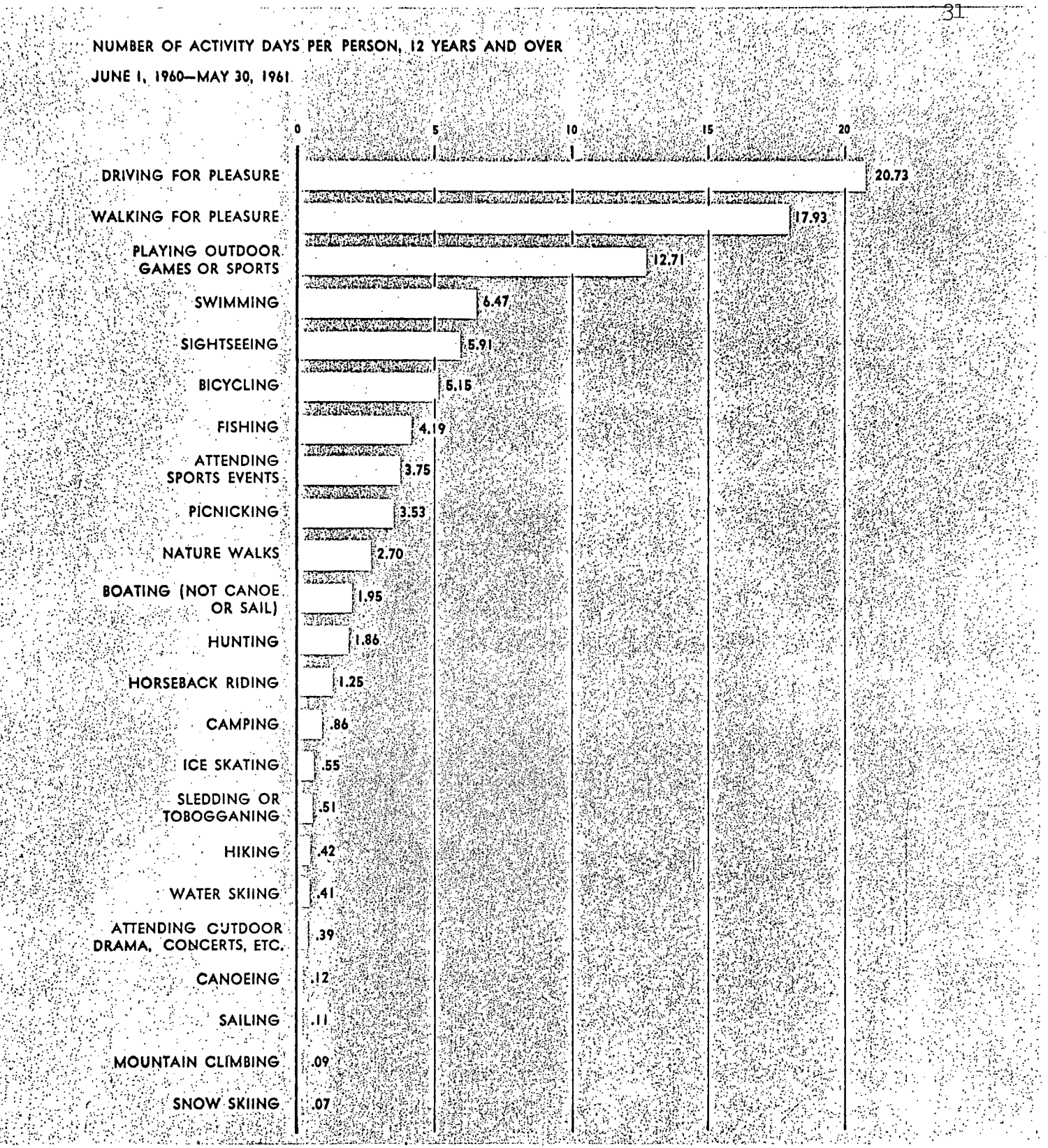

Figure 1 What Americans Do Most (Source; ORRRC, Outdoor Rec. for America, p. 33)

interest and demand. Closely associated with it is picnicking, with the result that some roadside facilities suffer from perpetual overcrowding during the season.

Camping is another activity enjoying unprecedented growth, particularly in respect to the use of trailers and campers. The space requirements established for camping by tent are inadequate to handle the load under these conditions. The questions of access and effect on the natural surroundings, both in terms of ecology and human perception, must be carefully studied in respect to the type of camping.

Some kinds of recreation are not only limited by the seasons but also by the specific natural conditions they require. Skiing is one of these. The natural requirements are met in only a few places and for many reasons may or may not be capable of development. There has been increasing interest in skiing and associated winter sports with resultant overcrowding on better or more accessible facilities. The capital cost of constructing the finished facility from the raw state can be high. The demand, however, is present.

To single out one element in the natural environment as having more importance in outdoor recreation than any other is not difficult. Water is undoubtedly that element. A whole range of water based activities enjoys high user-preference ratings. These range from simply looking at it while walking, hiking or driving, to travelling or skiing on it, swimming or fishing in it, or diving under it. Skin-diving and water-skiing were unknown a few years ago and, while the former does not require much space, the latter does. Arvill, sums it up this way.

> An angler on the bank needs a small space and quiet, a fisherman in a rowing boat may require half an acre, but a water-skiier requires fifty acres and his speed boat may create pollution.[36]

Pollution of natural water bodies is the result of human ignorance, thoughtlessness or neglect. Streams, rivers, or lakes so affected are unuseable for recreation and the costs of treating water to make it fit for human consumption are extremely high.

Water supply was once a matter of local concern; it has now reached the international level and is the subject of negotiation between national governments. It is a critical factor in the maintenance of life, and future use and allocations may have international ramifications.

Summary

This chapter has sought to introduce the subject of recreation, particularly outdoor recreation; to establish the fact that recreation is indeed an integral part of our society and the legitimate concern of government; that it is not trivial or inconsequential, or can be accommodated by utilizing leftovers from other land uses; that recreational facilities are necessary and land use for this purpose is as important, for instance, as timber production.

Some of the main factors affecting demand for recreation have been discussed. One point is clear, in many areas data necessary for a more complete understanding of recreation are scanty. This makes projection of future demands difficult.

> Master plans prepared for reservoir projects in the late 1940's and early 1950's are to-day

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[36] Arvill, op. cit., p. 114.

> outmoded...The predictions of annual attendance were found in practice to be greatly below the actual count made ten to twelve years after the estimate.[37]

The national parks are testament enough to the fact that our society considers many natural wonders to be unique and worthy of preservation and protection for the benefit of all who wish to experience nature unspoiled.

A multiplicity of pressures on the natural environment exist to-day. The continued provision of adequate recreation facilities of high quality will require careful planning and much further research. Dr. E.C. Crafts, Director of the Bureau of Outdoor Recreation of the United States, has said:

> It is astounding that there has been so little comprehensive research in an activity that involves 90% of the people; one half billion acres of land, a consumer expenditure of $20 billion a year and vast public programs.[38]

Daniel L. Leedy stated that "basic to making more meaningful surveys of the outdoor recreation resources are better soil, water, wildlife and vegetation mapping and classification techniques."[39] This is the area in which the concepts and principles of ecology can be put to use in making this information of more value for planning purposes.

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[37] Recreation survey of the Pacific Northwest Region, Part Two: Recreation Report, Recreation Subcommittee, Columbia Basin Inter-Agency Committee, October 1964, p. 19.

[38] 45th National Recreation Congress, op. cit., p. 65.

[39] Ibid. p. 67.

CHAPTER III

ECOLOGY

It has been established that there is a great demand for outdoor recreation and that the natural environment is the locale in which this demand is satisfied. There are a number of levels of activity which in turn require quite different facilities. These facilities differ in the degree to which they affect or change the natural environment and this is usually reflected in the scale of capital expenditure required to initiate the development.

Two major elements are inherent in the phrase "natural environment": its physical components such as air, land and water, and the biological or living components which inhabit the air, land and water and interact with them. The branch of science which concerns itself with the above relationships is called ecology. Odum describes its place in the biological or life sciences by using the "biology 'layer cake'".[1] (see figure 2.) Here ecology along with morphology, genetics, and others, are represented by the horizontal layers while vertical sections of the cake represent such large divisions as phycology, entomology, and others. "Thus ecology is a basic division of biology and, as such, is also an integral part of any and all of the taxonomic divisions."[2]

This chapter will deal with the study of ecology, some of its

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[1] Eugene Odum, Fundamentals of Ecology (Philadelphia: W.B. Saunders Co., 1959), p. 4.

[2] Ibid., p. 5.

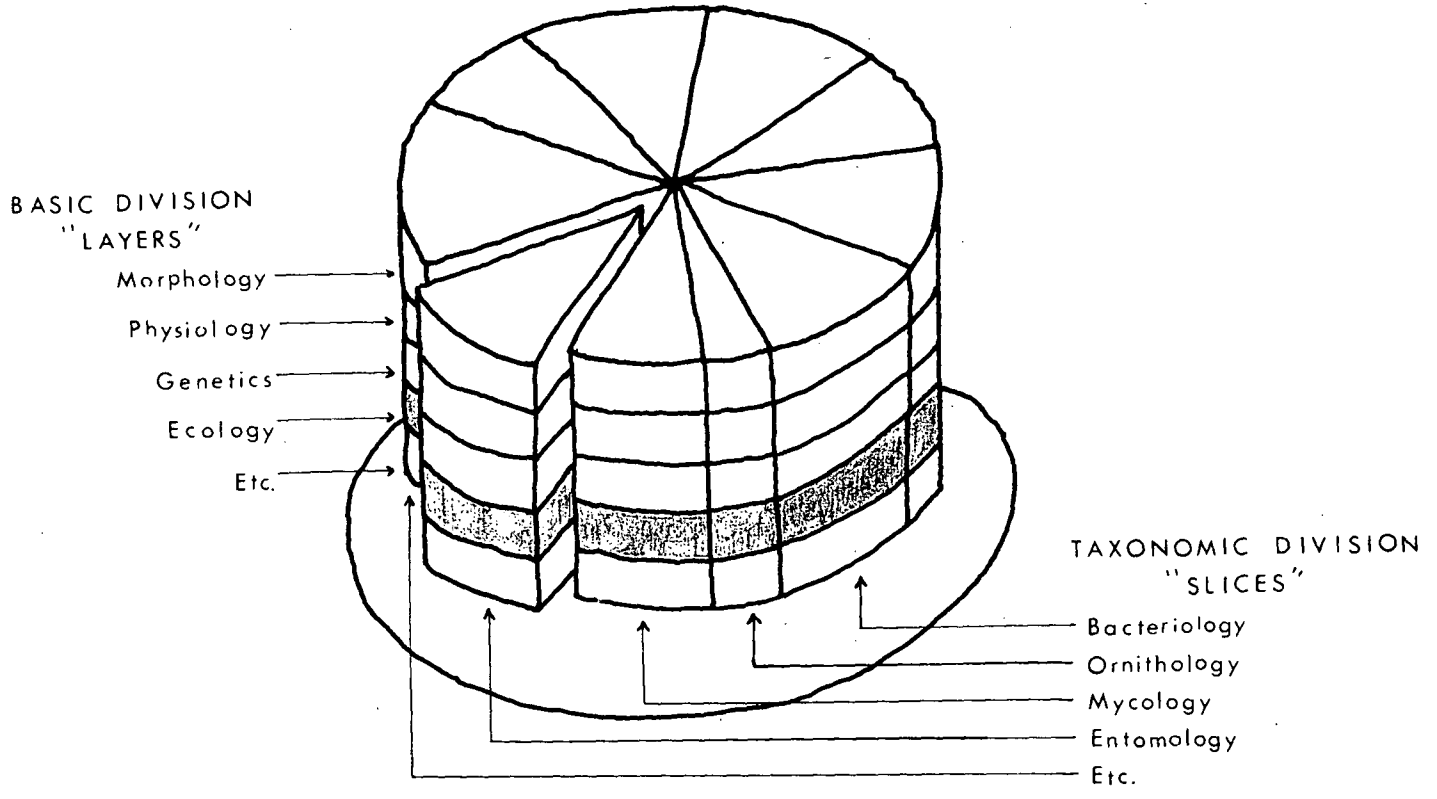

Figure 2 The Biology "Layer Cake" (Source; Odum, Fig. 1 p. 4)

principles and concepts, and some of its applications. Before proceeding with a discussion of principles and concepts it would be advantageous, at this point, to consider a short historical review of the subject. A comment by Sears is also worth noting at this time. Over the years he has observed two recurring criticisms of ecology. One, that it is "a matter of merely emphasizing the obvious"[3] and two, that "we do not know enough about bricks and mortar to get on with the building".[4] He counters these accusations with the following statement:

> As Frank Darling has demonstrated, ecology despite its fragmentary progress beginning with the environmental relations of plant life, is a study of the entire ecosystem. Of this system, man is not just an observer and irresponsible exploiter but an integral part, now the world's dominant organism. He has come into the system and survived this far by the bounty of that system plus his own marvelous power of adjustment. Even so the historical record is replete with his failures.[5]

Historical Review

The origins of the modern science of ecology are diverse and difficult to trace. Various authors on the subject tend to stress both different areas of biology and different men as well, depending to a large extent, on their own background and bias.

Nordenskiold[6] claims the beginnings of ecology for Carl Linnaeus the great Swedish botanist whose binomial system of nomenclature

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[3]Paul B. Sears, "Ecology: A Subversive Science", Bioscience, (July, 1964), p. 11.

[4]Ibid.

[5]Ibid.

[6]Erik Nordenskiold, A History of Biology (New York: Alfred Knopf, 1928)

is used in both plant and animal taxonomy to-day. These initial observations, in the mid-eighteenth century, were mainly concerned with the relationships between, and geographical distribution of, plants and grew out of Linnaeus's work on classification. Alexander von Humboldt coined the word "association" in 1805 and was essentially responsible for setting the study of plant geography on a sound scientific basis. He "finally dwells on the special advantages which soil and climatic conditions offer to the vegetable world in different latitudes."[7] Humboldt's name is common to the writings of many men on this subject and though better known for his work in other fields of science his biological investigations, partly attached to the natural philosophy of the day, are of no small importance.

> The whole of this conception of plant life and this grouping of its individual components according to common conditions of life, instead of according to the nomenclature of species, represents a new idea; it is true that Humboldt has learnt something, as he himself acknowledges, from Buffon, as well as from a number of earlier describers of landscapes, but out of these ideas and as the result of his own observations he created a new field of research, which was cultivated and extended at a later period with great success.[8]

From the first quarter of the nineteenth century on, many men working in a wide range of fields made valuable contributions to that we now call ecology. Generally, plant ecology evolved first and animal ecology, which does present some problems not inherent in the former, followed.

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[7] Nordenskiold, op. cit., p. 315.

[8] Ibid., p. 316.

This led, quite naturally, to the situation where one group considered only plants and the other group only animals. The general consideration of the dynamic interaction between the biotic and the abiotic evolved much later.

The origin of the term "ecology" is attributed to Ernst Haeckel in 1869. It has its root in the Greek word "oikos" meaning "house" or "place to live". There are a great many terms which have appeared over time to express a similar concept; however, very few are still in use. Karl Mobius made what in essence was an ecological investigation of oyster beds in 1865 and proposed the term "biocoenose". Some other terms were; "formations", Grisebach in 1838; "microcosm", Forbes in 1887; "naturkomplex", Markus in 1926; and the one in use to-day, "ecosystem", Tansley in 1935.

When did ecology become recognized as a discrete area of biology? W.M. Pearsall, writing on the Development of Ecology in Britain, would seem to put it about fifteen years later than the one fixed by Odum at "about 1900"[9]. Pearsall goes on to describe the situation, as he sees it, about the time of the First World War. There were essentially three lines of development. In Britain, investigation centred on "the habitat effects on vegetation as the characteristic feature of vegetative units."[10] In America, F.E. Clements published his book Plant Succession in 1916 and in it outlined the importance of climate, exposing the concept

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[9] Odum, op. cit., p. 3.

[10] W.M. Pearsall, "The Development of Ecology in Britain", in British Ecological Society Jubilee Symposium, eds. A. MacFadyen and P.J. Newbould. A Supplement to the Journal of Ecology 52 and Journal of Animal Ecology 33, (March, 1964), p. 1.

of climatic climax vegetation. In Russia, the pedologists were concentrating their attention on the relationship between the kind of vegetation and type of soil. The first definitive work concerning the fauna was Animal Ecology published in 1927 by Charles Elton.

Initially there were two recognized subdivisions within the subject. "Autecology", a term first used by Haberlandt in 1884, concerns the study of the relationships between an individual or a species and the environment. "Synecology", on the other hand, "deals with the study of groups of organisms which are associated together as a unit."[11] The modern trend is away from this break-down altogether and toward a recognition of four subdivisions; species ecology, population ecology, community ecology and ecosystem ecology, which are based on the levels-of-organization concept. Odum considers the number of levels to be arbitrary, but he recognizes ten. These are, in ascending order of complexity, protoplasm, cells, tissues, organs, organ systems, organisms, populations, communities, ecosystems and the biosphere. The five levels from organisms upward are the province of ecology.

It is principly in population ecology that mathematical theory and models have been developed. These techniques are also being used in the study of energy transfers and productivity where there has been a progression from flow chart models to the use of analogue-computer methods.

Ecology has come a long way in just over half a century. Much of its subject matter must be studied in situ and therefore the problems involved in developing a suitable methodology, are manifold.

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[11] Odum, op. cit., p. 8.

> Beyond its simplest and most elementary concepts, ecology deals with phenomena and problems that are mostly too complex for direct understanding or for handling by ordinary mathematical methods. Furthermore, they are frequently phenomena that are intrinsically changed by experimental methods and even by approaches involving factor analysis.[12]

Some Concepts and Principles of Ecology

The Ecosystem

As the ecosystem is considered to be "the basic functional unit in ecology",[13] it is the logical concept to explain first. Fosberg, in discussing the term, used part of Tansley's original definition, saying that the ecosystem represented "the interaction system comprising living things together with their non-living habitat...including 'not only the organism-complex, but also the whole complex of physical factors forming what we call the environment'"[14]

> The description of an ecosystem may include its spatial relations; inventories of its physical features, its habitats and ecological niches, its organisms, and its basic resources of matter and energy; the nature of its income (or input) of matter and energy; its pattern of circulation of matter and energy; the nature of its losses of matter and energy; and the behaviour or trend of its entrophy level. Collection of this basic data must precede an effective understanding of an ecosystem.[15]

Odum's restatement of Tansley's concept in 1955 was a refinement but added

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[12] F.S. Fosberg, "The Island Ecosystem", Man's Place in the Island Ecosystem, A Symposium, Tenth Pacific Science Congress, ed. F.R. Fosberg (Honolulu, Hawaii: Bishop Museum Press, 1963), p. 1.

[13] Odum, op. cit., p. 11

[14] Fosberg, op. cit., p. 1.

[15] Ibid., p. 2.

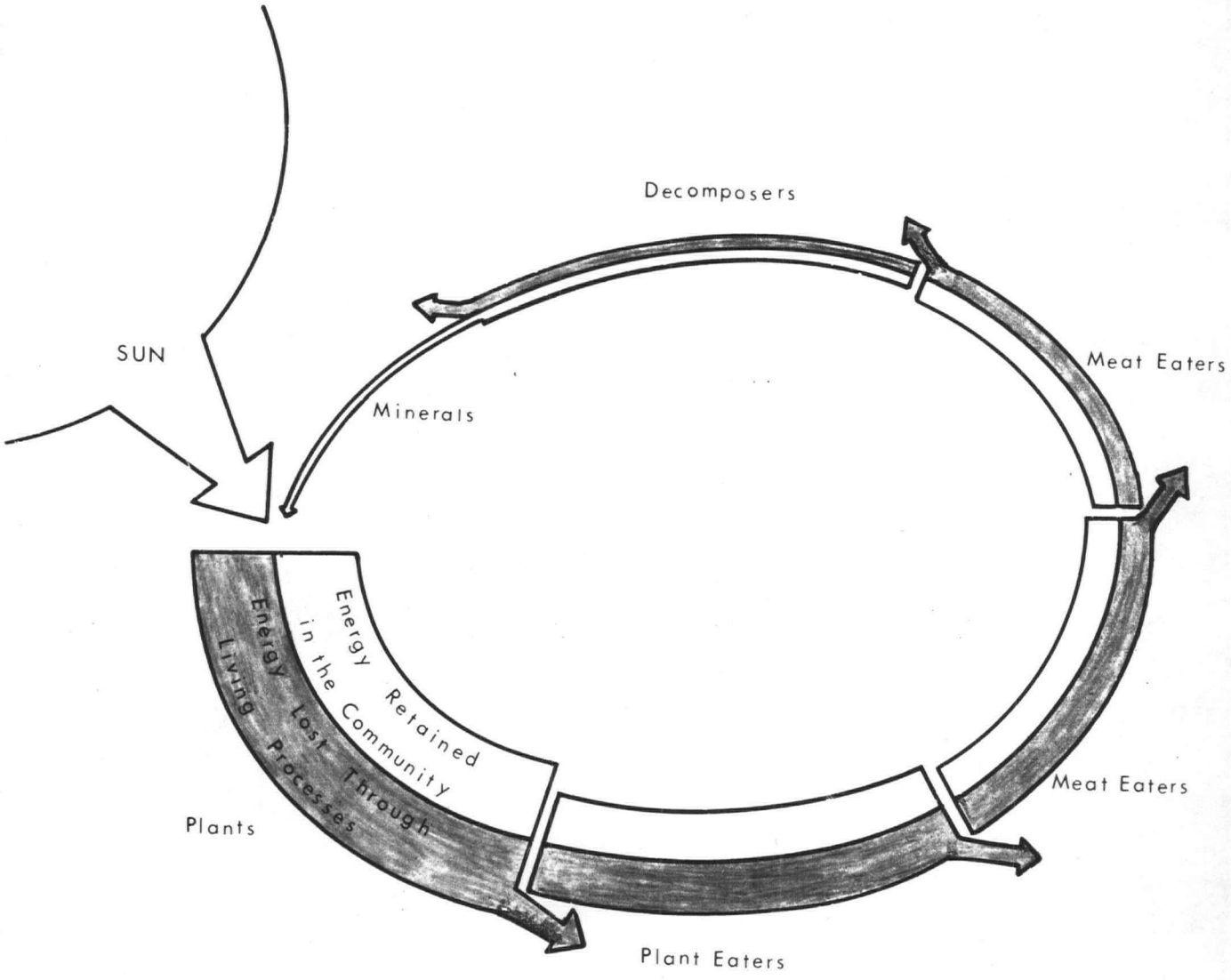

Figure 3 The Energy Cycle (Source; Niering, p. 65)

little to it.

The living or biotic sector of the ecosystem has two distinct characteristics based essentially on the mode of obtaining nourishment. The autotrophic portion are those organisms "in which the fixation of light energy, use of simple inorganic substances and buildup of complex substances predominate."[16] The hetertrophic portion is characterized mainly by the "utilization, rearrangement and decomposition of complex materials".[17]

It is now possible to describe four distinct elements of any ecosystem. One, the abiotic or basic organic and inorganic compounds present in general abundance; two, the producers or those autotrophic organisms capable of manufacturing food from simple inorganic materials, mainly green plants; three, the consumers, sometimes also called macro-consumers, or those heterotrophic organisms which ingest other organisms and/or organic material, mainly animals; and four, the decomposers, also heterotrophic organisms which reduce the highly complex dead matter to its simple elements, thus making it again available to the producers. These are mainly the bacteria and fungi. There are no discrete lines of demarcation between the above three living categories. The distinctions are made on a functional basis, but there is some overlap. This would appear to be justified for reasons of both descriptive clarity and methods of study.

The old idea of a "balance in nature" has been replaced by the concept of the "steady state" or homeostasis. This deals with the

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[16] Odum, op. cit., p. 10.

[17] Ibid.

stability of the functional relationships between the above mentioned four categories as they interact in a completely dynamic system. Action or inaction in any of the above areas automatically triggers appropriate reactions in the other sectors. One of the general principles which has evolved from the study of ecosystems is that diversity is necessary for maximum efficiency, minimum energy loss, and the highest degree of stability of an ecosystem. "In short, organisms exploit their environment to their best advantage-and contribute unconsciously to the ideal of non-loss of energy from the ecosystem as a whole and, at the same time, to the maintenance of the maximum active flow of energy through the ecosystem."[18] This principle is of particular importance to man in respect to his present environmental management policies. These seem to be committed to the idea that simplicity or monoculture is the ideal to be strived for if man is to maintain and "control" the environment to meet his own ends. Questions have only recently been asked, outside the field of ecology, regarding the possible end result of such a program.

> The change in the face of North America by reason of industrial man's dominance has resulted in a high standard of material well being, but the ecological consequence may not yet be understood fully nor the ultimate cost appreciated.[19]

Fosberg summarizes quite neatly the present tentative generalizations regarding ecosystems. Some of these would undoubtedly be questioned

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[18] F. Fraser Darling, "A Wider Environment of Ecology and Conservation", Daedalus, Vol. 96. No. 4., (Fall, 1967), p. 1008.

[19] John V. Krutilla, "Some Environmental Effects of Economic Development", Daedalus, Vol. 96. No. 4., (Fall, 1964), p. 1067.

by other workers in the field. However, these were presented during a symposium and were received with little argument or opposition.

> 1)all ecosystems are open systems (Evans, 1956); 2)ecosystems may be stable or unstable; 3)the stable ecosystem is in a 'steady state'; 4)the entrophy in an unstable ecosystem is more likely to increase than to decrease; 5)there is a tendency toward diversity in natural ecosystems; and 6)there is a tendency toward uniformity in artificial ecosystems or those strongly influenced by man.[20]

Ecosystems are complex and dynamic making study of them extremely difficult. Accurate methods of quantifying some of the features of an ecosystem are only now being investigated. Success has been limited to a few such systems. Derek Ovington's work on the forest ecosystem and that of several workers in the marine ecosystem are cases in point.

The Habitat

The habitat might be described as the place where any given plant or animal is found. A particular set of physical features is usually related to it. Though lichens are found on the branches and trunks of trees in moist coniferous forests, they are also found on bare, totally exposed rocks. These represent two different habitats.

The Community

The ecologic community is a very important concept and one more often associated with plants than animals because when a community is named it is often named for the dominant producer or green plant.

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[20]Fosberg, op. cit., p. 3.

According to Dice, "an ecologic community is an assemblage of ecologically related organisms composed of two or more species. Such a community may be of any ecologic rank and may include any number of associated individuals. An assemblage of individuals all of the same species is not a community, but a society."[21] To oversimplify, for purposes of illustration, it can be said that an ecosystem is made up of habitats and an ecologic community. The community and the association, as used by Humboldt, are roughly synonomous terms.

The Niche

This concept apparently originated with Charles Elton and relates to the function that an organism performs in its habitat. Fraser Darling uses as an example the wolverine in the Arctic and the hyena in the tropics. Both, as bone-grinding scavengers, occupy the same niche.

Stanley A. Cain describes at some length the "three ways the term 'niche' has been used."[22] He agrees that the functional usage was probably the initial concept. The other two he describes are the "place niche", equivalent to a microhabitat or biotope and the "ecological niche" where it is used in the sense of an ecosystem. "that is, as a biotope in the first sense together with the occupying organisms".[23] Odum subscribes to Elton's concept of niche.

The question of niche is very important when it is proposed to

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[21]Lee Ray Dice, Natural Communities (Ann Arbor: University of Michigan Press, 1952), p. 20.

[22]Stanley A. Cain, "Biotope and Habitat", The Future Environments of North America, eds. F. Fraser Darling and John P. Milton (Garden City: The Natural History Press, 1966), p. 47.

[23]Ibid.

introduce an exotic species of plant or animal to an area. An assessment must first be made of the status of the particular niche involved in the receiving community.

Succession

This concept and many of the attendant terms stem mainly from the work of F.E. Clements on plants. "Typically in an ecosystem, community development begins with pioneer stages which are replaced by a series of more mature communities until a relatively stable community is evolved which is in equilibrium with the local conditions."[24] Succession represents the systematic change and replacement in communities. The whole series is called the "sere". Any of the temporary communities in the series is called a "seral stage", and the ultimate community a "climax".

> The 'climatic climax association' is a biotic community that is not subject to progressive change but is in a fluctuating equilibrium with the prevailing climate and mature soil. The climax association has been arrived at by a series of communities replacing one another of which it is the termination capable of replacing and restoring itself. It is to be found mainly on mature soils which are themselves a consequence of the long interaction of climatic-biological-geological influences.[25]

Two types of succession are recognized. "Primary succession is initiated on a bare area where no vegetation has grown before."[26]

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[24]Odum, op. cit., p. 257.

[25]Cain, op. cit., p. 42.

[26]Henry J. Oosting, The Study of Plant Communities (San Francisco and London: W.H. Freeman, 1956), p. 240.

The invading vegetative types are classified by the amount of moisture found in the habitat in which they develop. A lichen establishing itself on a bare rock is called a Xerophyte, the habitat, xeric. This term denotes the dry habitat usually also lacking in organic material which would otherwise stimulate growth. The rate of such a xerarch succession is extremely slow. There are two other categories. The mesic habitat is of an intermediate nature and the hydric habitat, which is the opposite of xeric, begins with open water.

"Secondary succession results when a normal succession is disrupted by fire, cultivation, lumbering, wind throw, or any similar disturbance that destroys the principal species of an established community."[27] Hence succession following logging can be quite rapid. However, if a slash fire does get out of control and the organic material of a shallow soil is consumed by it, xerach succession may result.

These are some of the important principles and concepts of ecology. The list is by no means complete but rather than discussing any more it might prove to be more profitable to apply these few to a particular ecosystem. As has been mentioned, "the term ecosystem may be applied concretely to a single example or abstractly to a class, comprising examples similar in specified significant respects, either embodied in a definition or commonly understood. Familiar examples of this abstract usage are the soil, the strand, the prairie, the tropical rain forest, the tundra, the oceans, streams, lakes and, in the present instance, islands."[28] To this can be added, wetlands, which take several forms, lagoons, swamps, bogs, lakes, estuaries and are defined by Arvill

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[27] Oosting, op. cit., p. 240.

[28] Fosberg, op. cit., p. 2.

as being "areas of marsh and water less than twenty feet deep (six metres)."[29] He goes on to discuss three specific cases of international significance, the Everglades, Florida, U.S.A.; Broadland, East Anglia, England; and the Camarque, South France and concludes:

> These cases reveal the great economic, scientific and aesthetic wealth of wetlands, which are an essential part of the ecology of river basins and serve in many unique ways to meet man's needs.[30]

The wetland, like some alpine or arctic environments, is very vulnerable to the outside influence of man be it intentional or not. Presumed inconsequential actions may have broad ramifications not easily alleviated.

Ecology of a Wetland

Even within the general class of wetland there are a great many distinct classes each with its own characteristic flora and fauna. H.L. Mason presents the following as "a practical, though rough, sort of classification that will comprehend all the major characteristics of wet-land habitats..."[31]

I Water Standing or Essentially So
Presence of water permanent and level fairly persistent
Open water surface the most conspicuous feature
Fresh Water
Lakes
Ponds

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[29]Robert Arvill, Man and Environment (Harmondsworth: Pelican Books, 1967), p. 154.

[30]Ibid., p. 160.

[31]H.L. Mason, A Flora of the Marshes of California (Berkeley and Los Angeles: University of California Press, 1957), p. 4.

Salt Water
Salt lakes
Bays and Oceans
Estuaries
Vegetation more conspicuous than water surface
Vegetation dominantly herbaceous
Marshes
Alkaline marshes
Salt marshes
Brackish marshes
Fresh-water marshes
Bogs
Quaking bogs
Floating bogs
Vegetation dominated by trees or shrubs
Swamps
Presence of water intermittent or at least the level widely fluctuating
Intermittence seasonal
Vernal pools
Vernal marshes
Intermittence tidal
Salt-water marshes
Seasonally salt and fresh-water marshes
Fresh-water marshes subject to tidal influence

II Water Flowing
Live streams
Intermittent streams
Irrigation ditches
Hillside bogs
Streamside marshes

III Wet Soil Adjacent to Habitats with Standing or Flowing Water
Strand areas
Riparian lands
Lacustrine lands
Seasonally wet floodlands[32]

The flora and fauna characteristic of any of the above classes will be dependent on the geographic location, in particular the latitude, of the wetland.

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[32]Mason, op.cit., p. 4.

The richness of the wetland milieu is directly related to the water source and its stability, or at least regularity, such as in a tidal marsh where there is water level fluctuation but is is of a regular nature. The form and content of the water is as important, in terms of what flora and fauna develop, as the water itself. It is necessary to determine whether it is flowing or standing, brackish, saline or fresh, high or low in mineral content, and many other physical, chemical and biological factors. These features of the water when combined with the natural character of the substrate will limit, to a large extent, the flora and fauna which develop.

The flora are the pioneers of wetlands. Three broad classes can be described. The floaters are of two kinds. Duckweed is rootless and merely floats on the surface of shallow water. The leaves and flowers of the water-lily are connected by long leaf stalks to the stem or rhizome buried in the bottom sediments. The submergents, such as some pondweeds and algae, are a group that live entirely under the water. The emergents are highly water tolerant. Bullrushes and cat-tails, for example, normally thrive with their rooted portion under water and the remainder of the plant protruding above.

> Rooted or floating, submerged or emergent, with broad leaves on the surface or ribbony underwater leaves (or both), aquatic plants make a fundamental difference to the other living things with which they share the water. Those that are rooted serve as bases to which protozoans and algae can attach themselves. They give concealment to crustaceans, insects, and fishes, enabling many species to elude

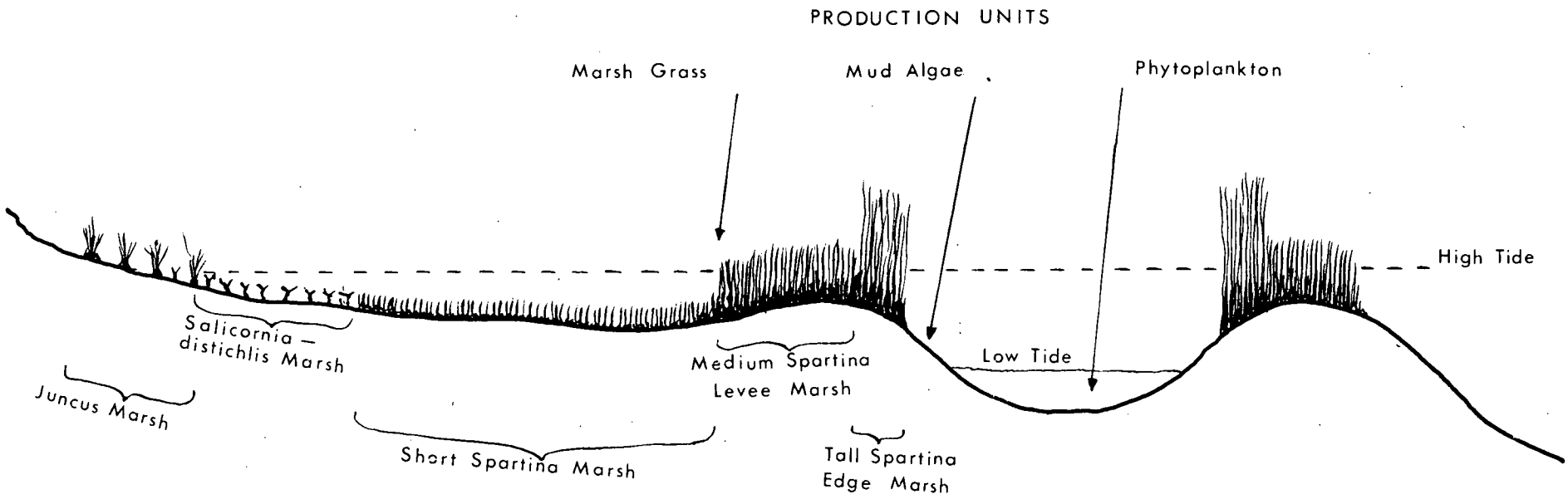

Figure 4 Zonation of a Salt Marsh in a Georgia Estuary (Source; Odum, Fig.115, p.365)

> their enemies for a time and populate the waters.[33]

Once an area is colonized by either cat-tails or bullrushes new habitats are developed as a result. In Europe the cord-grass Spartina townsendii is particularly efficient in colonizing tidal mud-flats. It is an interesting case in that it is a natural hybrid of the native English species Spartina martinia and an introduced American form Spartina alterniflora. Initially it was slow to develop but since 1870, when it was first seen, it has almost completely replaced "the original American parent."[34]

> And it is on the whole a rather useful plant, because it stabilizes previously bare and mobile mud between tide-marks, on which often no other vascular plant could grow, helps to form new land and often in the first instance provides salt-marsh grazing. Its effects upon the coastal pattern are, however, not yet fully understood by physiographers and plant ecologists; but Tansley remarks that 'no other species of salt-marsh plant, in north-western Europe at least, has anything like so rapid and so great an influence in gaining land from the sea.'[35]

Hence, once an area is colonized, different species move in to fill the newly created habitats. With each succeeding addition of a plant or animal there is dynamic readjustment and interaction. There may even be a climax community established under certain conditions and

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[33]William A. Niering, The Life of the Marsh (New York: McGraw-Hill, 1966), p. 108.

[34]Elton, op. cit., p. 26.

[35]Ibid.

over a period of time. In Europe, the general progression through seral stages to a climax seems to be the usual case. According to Chapman, "deviation of a succession is not common with coastal vegetation, but it has been recorded on Nova Scotian salt marshes where it was produced as a result of persistent mowing for hay grass."[36] In a European mud flat raised almost to the level of the high tide such a climax community is quite often dominated by the sea rust Juncus martimus.[37]

In a study of the marshlands of the Torch River area of Saskatchewan[38] succession in the muskegs was noted to be influenced by ground fires and impeded drainage. Where muskegs had been partially dried by repeated burning, grasses began to take hold and were followed by scrub willow and birch. This scrub was followed by white spruce which eventually came to dominate the area, though never completely replacing all of the deciduous trees. This progression provides numerous habitats for a wide variety of fauna. In this case sharp tailled grouse, ruffed grouse, ducks, deer, elk and moose are found in abundance.

Generally, the fauna follow the flora. As the variety and complexity of the vegetation increases the number of habitats available to small and large mammals, waterfowl and upland birds increases also. Once this stage is reached, however, the animals influence the vegetation and in some cases retard or actually stop the processes of succession.

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[36] V.J. Chapman, Coastal Vegetation (London: Pergamon Press, 1964), p. 3.

[37] Ibid., p. 94.

[38] M.I. Dirschl and H.S. Maliepaard, Wildlife and Rural Development, A Report to the Co-ordinating Committee of the Torch River Rural Development Area, April 1963.

The beaver, for instance, not only falls trees for food and lodge construction, but the lodges themselves, built across streams function as dams and greatly affect the amount and depth of the water retained behind them as well as the flow downstream. Hence beavers may be very effective water controllers in a wetland environment. Browsers like deer and moose can also greatly modify the vegetation of an area, particularly if they are protected from the effects of natural predation.

A classical example of prey-predator relationships is that of the Kaibab deer population. The 700,000 acre Kaibab plateau, north of the Grand Canyon, Arizona, supported an estimated 4,000 deer in 1907. For sixteen years man actively tried to eliminate the predators. The deer herd increased to over 100,000 by 1925 and virtually every bit of vegetation within reach was eaten. The whole plateau was badly overgrazed and more than forty percent of the population starved to death in two winters. Even though the numbers appeared to stabilize at about 10,000 the range over which they had to feed was badly depleted and would require many years to recover.

The inter-relationships of flora and fauna in the wetland as elsewhere are more easily understood through the relationships of the food chain. The sun forms the first link in any such chain. A producer is next, followed by a variable number of consumers. One such chain in a fresh water marsh might be, the sun, algae, May-fly nymph, sunfish and great blue heron. Sometimes, for certain animals, there are no alternative choices for food. The everglade kite is one of these.

The Florida Everglades have been in difficulty since about 1948

when man interfered with the natural water cycle. This was done to supply the needs of an expanding agriculture and for flood control. No heed was paid to the swamp and it is drying up. Much of the wild life is threatened with extinction while the question of water is slowly dealt with by the political system.

> The everglade kite faces the most serious threat, because of its specialized feeding habit. It eats only one kind of snail. Since drought is killing the vegetation on which the snail feeds, fewer snails are able to survive. As a result, the everglade kite is in great danger of extinction.[39]

The tidal marsh performs a number of activities as part of its natural ecological cycle. This is well illustrated in the following letter to the editor of Landscape Architecture magazine. The letter was prompted by a previous issue to which a variety of authors, including Ian McHarg, contributed, on the subject of ecology.

> Through hundreds of thousands of years man has evolved as a creature of nature, dependent for his health and survival upon his adjustment to it. Modern technology has suddenly been dislocating this adjustment to his detriment.
> The evolution of the landscape is the product of many natural forces interacting for millions of years. Even in the coastal metropolis, certain features can be preserved by plan to the enrichment of human life. A prime example is the tidal wetland, all too frequently destroyed to the detriment of the whole community.

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[39]Niering, op. cit., p. 17.

> The estuary, with its productive meadows and meandering streams, is one of the loveliest and most restful features of our Atlantic coastline. As an ecosystem, it exhibits all those healthy features listed by Mr. Ian McHarg as desirable attributes to the landscape-diversity, interdependence, and stability. Acre for acre, they are as productive (without human care) as the most carefully tilled agricultural upland. Their contribution to the enrichment of human life begins with the purification of the air. They provide the base for a food chain of fantastic complexity and a nursery ground for species of fish, upon which our sport and commercial sources of food are dependent. They serve as a feeding and resting ground for migratory waterfowl and for man, an aesthetic backdrop for his home and for his recreation at the water's edge. And they protect his shores from erosion and the underground watertable from the salt of the sea. Our society can ill afford further destruction of this wonderful resource.[40]

The wetland is a complex ecosystem; the balance of which is directly tied to its source of water. Any actions that change the amount, distribution or quality of water supplied a wetland will inevitably be felt throughout the whole system. The reactions may be sudden and dramatic or, as more often is the case, they are slow and almost imperceptible, making their realization difficult. Thus dangerous or intolerable conditions may not be realized until it is too late to effect their alleviation.

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[40]Richard H. Goodwin, Dept. of Botany, Connecticut College, New London, Connecticut in a letter to the Editor Landscape Architecture Vol. 57 No. 4. (July 1967).

Some Applications of Ecology

Four areas where ecologic principles have been applied with some success are agriculture, forestry, range management and wildlife management. In agriculture and forestry the use of the concepts has not always been wise, mainly because they were used with very narrow ends in view. The concepts of productivity and limiting factors have been used to increase yields in agriculture, while the silviculturist has applied forest ecology to the task of producing marketable timber. There is an exploitive element in both of the above applications whereas in both range and wildlife management it was a restorative need which led to the application of ecologic principles.

Overgrazing by cattle and sheep was the primary reason for range management, a form of applied ecology. Under the effects of persistent overgrazing a perennial grass community may undergo the following successive changes. Perennial forbs would begin to mix with the grasses which would gradually be replaced by perennial weeds. (see Figure 5) Ultimately, these would largely be replaced by a sparse growth of annual weeds and then the land would be open to erosion by surface water and wind.[41] Range management seeks to

> prevent considerable waste of funds and effort by pointing out that plant cover and animal numbers are directly related to intensity of use, and that an adjustment of use, in this instance

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[41] E.H. Graham, Natural Principles of Land Use (New York: Oxford Press, 1944, p. 52.

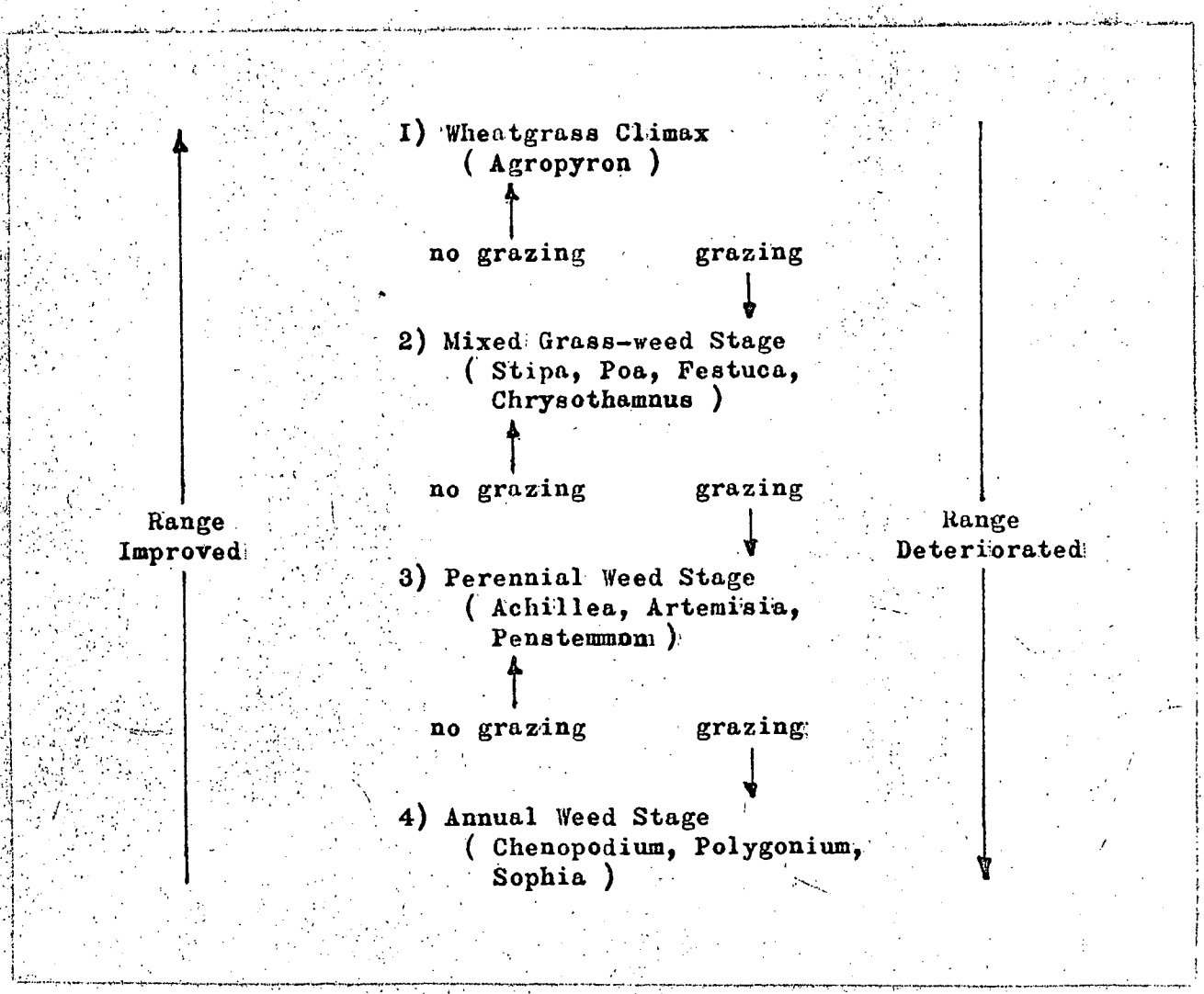

Figure 5 Wheatgrass Grazing Land, Central Utah (Sampson, 1919)

(Source; Graham, Nat. Principles of Land Use, p. 145)

> reduction of livestock, may not only diminish the weeds and rodents by removing the reason for their occurence, but result in a more productive range.[42]

Through an understanding of the grassland ecology, proper management of the resource can be undertaken so that it is not down-graded to the point where restoration is economically impossible.

In wildlife management, protection has been sought along three lines of development. Through application of game laws and "bag" limits breeding stocks have been preserved. In the case of some game birds and fish, artificial stocking has been carried out. Then, more generally, habitat creation, improvement, and maintenance has also been attempted. Odum considers this to be the most important, for "if suitable habitat is lacking, protection or stocking is useless."[43] Aldo Leopold was a strong advocate of habitat improvement, recognizing that the transition zone or ecotone between two different communities contained a wide range of habitats. This he called the "edge" and by simply increasing the amount of edge the number of habitats could be increased. In some cases it was a matter of management in order to retain a particular seral stage for the benefit of a selected species of animal.

These four examples are representative of some of the areas where ecological information has been used to the benefit of man. Admittedly in some cases it has come almost too late, or been prompted by

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[42] Graham, op. cit., p. 52.

[43] Odum, op. cit., p. 433.

initial errors and ignorance. Soil conservation in the United States was such a case.

> Some who unwittingly diminish the productivity of our land were not raiders at all, but imprudent husbandmen like the early tobacco and cotton farmers who 'wore out' two or three farms in a futile and half-hearted search for the secrets of soil fertility. The homesteaders and their sons who plowed up the Dust Bowl were honest husbandmen who never understood The Draconian Laws of drought and the importance of grass cover in an arid land.[44]

Man must understand the natural system with which he is dealing before introducing change of any kind.

Summary

Ecology, as a science, is young. A broad outline of its origin, scope and some of its applications have been briefly discussed in this chapter. It deals with the living and the non-living and the whole biosphere is its laboratory. The linkages between living and non-living, and living and living are complex. One continuous thread running through the work of many distinguished scientists in this field is that diversity in ecosystems, natural or artificial, is necessary for the stability of those systems. Man tends to simplify ecosystems for his own short term ends which are often cast in economic terms. But, what are the long term economic results of such action? Can the actual cost of the Dust Bowl be calculated?

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[44]Stewart Udall, The Quiet Crisis (New York: Avon Books, 1964), p. 79.

> We are forever tempted, because of political and economic expediency, to remove just one more 'useless' species or process; we are sure to feel that there is room for just one more person. The Golden Rule, however, is a flexible guide and not a yardstick; and Schweitzer's Reverence for life and Aldo Leopold's Ecological Conscience come close to what I suggest as proper companions to even the most expert ecological manipulation.[45]

Outdoor recreation takes place in the natural environment. In planning for this function in the face of a seemingly ever increasing number of users the ecological "concepts of 'levels of biological integration and points of view', and their philosophic basis, formulated by Frank E. Egler twenty-five years ago"[46] must surely form a part.

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[45]Daniel McKinley, "The True Wealth of Nations: The Need for an Ecological Conscience", Landscape, (Autumn, 1962), p. 15.

[46]Dillon Ripley and Helmut K. Buechner, "Ecosystem Science as a Point of Synthesis", Daedalus, Vol. 96, No. 4., (Fall, 1967), p. 1192.

CHAPTER IV

PLANNING FOR OUTDOOR RECREATION

Each of the preceding two chapters has considered an important element of the problem of planning for outdoor recreation. In Chapter II, the question of recreation, leisure time and some other elements of an increasing demand were examined. In Chapter III, a few of the principles and concepts of the science of ecology were described.

It appears from the above that "the growth of a largely urban, increasingly leisured and highly mobile population is making new demands for the use of common land,[1] particularly for outdoor recreation".[2] Though this quotation refers specifically to the English context it is equally applicable to the land beyond city boundaries in North America.

Land, generally, is under pressure from a variety of sources. Only approximately twenty-five percent of the earth's surface is land, and half of this is not utilizable under current economic conditions. The feasibility of habitation in the polar regions, deserts or mountainous areas is still a future possibility.

> At present, the earth has about 25 million square miles of habitable and cultivable land, but nearly 780 square miles (half a million acres) are being

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[1] The term "common land" in this instance refers to a particular form of land tenure found in England.

[2] Jonathan Wager, "Outdoor Recreation on Common Land", Journal of the Town Planning Institute, Vol. 53. No. 9. (November, 1967), p. 398.

> taken out of cultivation every day for urban expansion, mineral working and roads and by erosion. It has been calculated that every human requires the product from at least 2½ acres per annum to support him. It is obvious, therefore, that with this rocketing population and the decline in the quality of his environment, man cannot afford to squander or misuse the land.[3]

Urbanization, industry and modern transportation transform large areas of land each year for their needs. Modern airports, for instance, require huge areas of flat land, which for reasons of safety, become restricted. It is also recognized that "more often than not, these changes are executed with little or no regard for the intrinsic values inherent in Nature's design."[4] Yet, sometimes, a success in this area is acclaimed.

> McHarg and Wallace have shown by constructing an appropriate many-sided model, what great opportunities for improving the human habitat actually exist, once the forces that are now blindly despoiling the landscape and depressing every human value are guided with intelligence and imagination to more valid goals.[5]

This chapter is composed of three sections. First, the historic aspect of parks is reconsidered in relation to their planning. Initially, the only planning for outdoor recreation resulted in the provision of city parks. These tended to be alloted on a rather arbitrary basis. However, the boundaries of the city or town were discrete and beyond it lay

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[3]Robert Arvill, Man and Environment (Harmondsworth: Pelican Books, 1967), p. 25.

[4]Philip H. Lewis Jr., "Quality Corridors for Wisconsin", Landscape Architecture, Vol. 54. No. 2. (January, 1964), p. 100.

[5]Lewis Mumford, commenting on "Plan for the Valleys vs. Spectre of Uncontrolled Growth" by Ian McHarg and David A. Wallace, Landscape Architecture, Vol. 55. No. 3. (April, 1965), p. 179.

the countryside which was relatively untouched, rural in character, and could be visited at will. The park concept will be traced quickly from its city origin to its ultimate position of national status.

The second and third sections relate not only to parks but to the countryside and the planning for outdoor recreation as a whole. Parks represent only a portion of the whole outdoor recreation scene. It is the character of the countryside that draws city-dwellers out; and to-day the bulk of the people live in cities. Yet it is the character of the countryside itself that is being changed so rapidly. The tendency seems to be toward a monotonous sort of quasi-urban continuum, any individual landscape character being degraded to a level of equal anonymity. This amounts to the haphazard extension of the urban scene, in a much diluted form, into the countryside. This topic has been the subject for a series of conferences in Great Britain entitled The Countryside in 1970. Preceding it there has been a "National Nature Week".

> This display of interest in the conservation of nature was most encouraging, but that is not enough to provide a concerted plan for future action. The question that had to be answered was, 'What sort of countryside do we all want to see in 1970?' That is how this Conference came about and why its title was "The Countryside in 1970."[6]

The interesting implicit assumption in that question is the idea that we are capable of doing something about it. But many of the problems of the countryside have their roots in a misunderstood or ignored ecological

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[6] H.R.H. The Duke of Edinburgh, Foreward, The Countryside in 1970 (London: Her Majesty's Stationery Office, 1964), p. xxi.

fact. Streams become biologically barren through pollution. Even the simple dumping of heated water from a power station can completely change the ecology of a stream by raising the temperature of the water. Alpine communities can be destroyed by the trampling of the feet of man or his domesticate ungulates. In the alpine passes of Switzerland and Austria the alpine flora have been greatly reduced around parking areas through trampling and picking. Succession is extremely slow in such areas and in one study of climax tundra in Rocky Mountain National Park, Colorado, U.S.A., exposed to visitors for twenty-five years, it was estimated "that a minimum of 500 years will be necessary for the restoration of the ecosystem".[7]

Marshlands, such as the unique Everglades, are threatened by water regulation that does not consider the marsh. Yet it is designated a National Park and is being managed as such by National Park Service. The vital question of water regulation, however, is outside their control and must be fought for through Congress. The question is, will there be a National Park left by the time the water problem has been settled politically.

The second section considers the "ecological point of view" as a means of overcoming or at least meeting the above problems in the planning for outdoor recreation. The concept of ecology as a means of synthesis, as an attitude, or as a basis for a holistic approach to such problems, is necessary to meet to-day's increasing demands for recreation.

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[7]Dr. Bettie Willard Scott-Williams, "Recoverytime 500 Years", Landscape Architecture, Vol. 57. No. 2 (January, 1967), p. 102.

The third section concentrates on water, vegetation and wildlife; three significant factors in the world of the outdoor recreationist. Ecological error in the utilization of these three resources can result in a chain of irreversible events, culminating, in some cases, in the extinction of a species, or loss of a particular community forever.

The Park Concept and Planning for Outdoor Recreation

Reference was made earlier to the fact that the park concept was born in the city. It was advocated in America about the middle of the nineteenth century and action followed approximately twenty years later.

Ekirch states that "the organized movement for the modern-type city park seems to have had its inception in the idea of making American burial grounds into scenic cemeteries".[8] He goes on to quote Andrew Jackson Downing, who noted that "these cemetaries are the only places in the country that can give an untravelled American any idea of the beauty of many of the public parks and gardens abroad."[9]

Downing edited a paper called the Horticulturist from 1846 to 1852 and "incessantly preached the gospel of public parks as they were being established in England."[10] He was completely captivated by the English landscape park of Lancelot Brown and Humphrey Repton and about 1850, induced a young Englishman, named Calvert Vaux, to come and help him with his work on

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[8] Arthur A. Ekirch Jr., Man and Nature in America (New York and London: The Columbia University Press, 1963), p. 30.

[9] Andrew Jackson Downing, Rural Essays (New York: Putnam, 1853), p. 44, quoted in Arthur A. Ekirch Jr., Man and Nature in America (New York and London: The Columbia University Press, 1965), p. 30.

[10] Chas. E. Doell and Gerald B. Fitzgerald, A Brief History of Parks and Recreation in the United States (Chicago: The Athletic Institute, 1954), p. 182.

the Horticulturist.

When Downing died in 1852, Vaux carried on his work. Later, when a competition was held for a design for Central Park, New York, he approached Fredrick Law Olmsted and together they worked out the design that won the competition.

The question of a large park for New York was not new. Downing had proposed a site and the newspaper editor, William Cullen Bryant, had been agitating for such a consideration since the 1840's. Bryant accepted Downing's proposal but also was in favor of one in Jones Wood on the East River.

> The proposed parks became a political issue in the mayoral election of 1851: Kingsland, who was elected, was a supporter of the proposals, but in 1853 an act was passed for the acquisition only of the Central Park land; this land became available in 1856.[11]

Olmsted had travelled widely in England and continental Europe and was particularly impressed with Paxton's work in Birkenhead Park which he had visited in 1850. Vaux, though trained in Europe, had been strongly influenced by his association with Downing. The talents of these two men, combined in the formulation of the design for Central Park, provided the impetus for a continent-wide movement in this direction.

This idea of large parks within cities was readily embraced. Olmsted was commissioned by many of the major American cities for similar tasks. In Canada, he did work in Montreal and Niagara Falls. The idea of park systems was also put forward by him since he saw Central Park as only one of many

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[11] George F. Chadwick, The Park and the Town (London: The Architectural Press, 1966), p. 182.

others to be constructed in the surrounding area. This idea was further extended by a pupil of olmsted, Charles Elliot, who was instrumental in the establishment of the first metropolitan park commission, located in Boston.

> Even as American cities were establishing their individual parks, as well as whole park systems after the Olmstedian manner, certain events took place that were destined to influence the future concept and scope of park development: the establishment of the first national park, the creation of metropolitan park systems, and the introduction of the "playground movement".[12]

The park concept leapt from the local city level to national status with the founding in 1872 of Yellowstone National Park. The state or provincial park post dates the national park concept and "consequently, the function of state parks at first was conceived to be substantially that of the National Park Service transferred to a state level".[13]

Chadwick credits Olmsted with considerable influence in the whole field.

> Virtually single-handed he had formed a new profession in America, and not only this, he had made fundamental contributions to public park design, not simply taking over English precedents, but pioneering many new ideas which are even more valid and necessary in the city and region of tomorrow than they were in the American cities and countryside of yesterday: the separate traffic systems of Central Park, designed for enriching human life, not merely for unthinking easing of traffic flow: the parkway system of Boston; the realization that green space is both a necessary and an economic element of

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[12] Doell and Fitzgerald, op. cit., p. 31.

[13] Charles E. Doell, The Elements of Park and Recreation Administration (Minneapolis: Burgess Publishing Company, 1963), p. 49.

> the town; the provision of playing space for small children--all these are truly biotechnic realizations, and to these must be added the work at Yosemite, and with Vaux at Niagara Falls, the presursors of the regional reservation and national park.[14]

Olmsted viewed the park as an intrusion or reserve of natural surrounding within the city to be used only in a passive or semi-active way. In the early 1900's when demand occurred for active recreation in the form of playing fields for active sports and covered outdoor gymnasiums conflicts developed between those advocating such activities and "park purists" who maintained that they did not belong in the park. Thus the first indications that parks could not serve all outdoor recreational demands, and survive, were heard.

Inherent in the idea of planning for parks is the notion that they must also be "planned", or designed, within themselves. Olmsted conciously applied design principles but active recreation was not one of his considerations. Parks of all kinds are now only a part of the total outdoor recreational facility; the countryside at large is assuming an increasing role in this respect.

A limited impression of the pressures being exerted by the demands for outdoor recreation can be gained from the record of attendance at Canadian National Parks. (see Figure 6 and Table 4). In less than ten years visits to national parks have more than tripled in the Central and Atlantic Regions and more than doubled in the Western Regions. In 1966-67 Banff National Park, alone, had more than two million visitors, over two hundred thousand more than the previous year.

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[14] Chadwick, op. cit., p. 195.

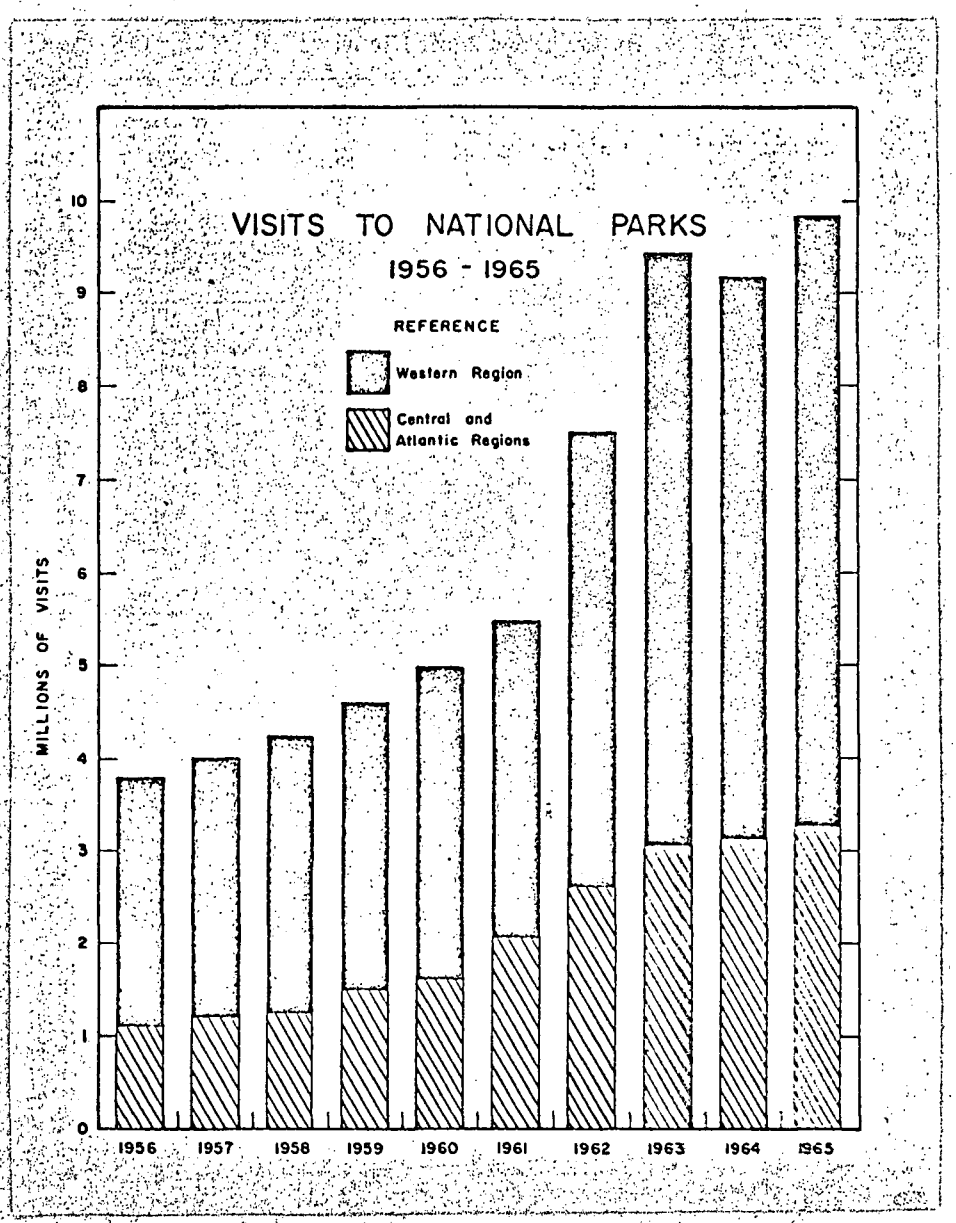

Figure 6 Canadian National Park Attendance (Source ; Dpt. N. Affairs, Annual Report p.127)

Table 4

Comparative Statements of Visitors to the National Parks for the period April 1 to March 31

National Parks	1965-66	1964-65	Increase or Decrease	%
Banff	1,803,490	1,605,784	197,706	12.31
Cape Breton Highlands	729,443	624,942	104,501	16.72
Elk Island	197,728	175,105	22,623	12.91
Fundy	679,406	566,443	112,963	19.94
Georgian Bay Islands	8,361	8,371	- 10	N/C
Glacier	767,206	705,150	62,056	8.80
Jasper	522,658	480,102	42,556	8.86
Kootenay	638,812	548,515	90,297	16.46
Mount Revelstoke	741,457	706,015	35,442	5.02
Point Pelee	697,328	661,166	36,162	5.46
Prince Albert	152,256	140,521	11,735	8.35
Prince Edward Island	967,372	1,112,536	-145,164	-13.04
Riding Mountain	687,959	681,313	6,646	.97
St. Lawrence Islands	60,330	67,109	- 6,779	-10.10
Terra Nova	108,738	66,180	42,558	64.30
Waterton Lakes	393,426	371,258	22,168	5.97
Yoho	689,313	658,518	30,795	4.67
Total	9,845,283	9,179,028	666,255	7.25

National Parks	1966-67	1965-66	Increase or Decrease	%
Banff	2,044,537	1,803,490	241,047	13.36
Cape Breton Highlands	851,653	729,443	122,210	16.75
Elk Island	204,286	197,728	6,558	3.31
Fundy	753,310	679,406	73,904	10.87
Georgian Bay Islands	10,438	8,361	2,077	24.84
Glacier	917,264	767,206	150,058	19.55
Jasper	595,164	522,658	72,506	13.87
Kootenay	722,743	638,812	83,931	13.13
Mount Revelstoke	872,367	741,457	130,910	17.65
Point Pelee	726,035	697,328	28,707	4.11
Prince Albert	146,624	152,256	- 5,632	- 3.69
Prince Edward Island	1,130,773	967,372	163,401	16.89
Riding Mountain	738,724	687,959	50,765	7.37
St. Lawrence Islands	122,304	60,330	61,974	102.72
Terra Nova	179,647	108,738	70,909	65.21
Waterton Lakes	487,589	393,426	94,163	23.93
Yoho	864,454	689,313	175,141	25.40
Total	11,367,912	9,845,283	1,522,629	15.46

(Source; Annual Reports of the Dpt. of N. Affairs & Nat. Resources, 1965-66, p. 128 and the Dpt. of Indian Affairs & N. Development, 1966-67, p. 130)

Outdoor recreation has continued to change. The automobile became a recreational vehicle in that it allowed for a much larger radius of recreational operation within the hours of a single day. Simply driving for pleasure or for a picnic became a form of mass recreation. The countryside, rather than a single park, complete within itself, was the objective of the recreationist. A new dimension has been added to the planning for outdoor recreation, parks, in themselves, are no longer enough.

The "Ecological Point of View" as a Basis of the Planning for Outdoor Recreation

Little attention has been paid to the recreational resources or potential of the countryside as a whole. Until recently its use for recreation has been taken for granted simply because it has always been there and available for the use of the urban dweller. But pressure of numbers has put an entirely different light on the issue.

> Some landowners are now denying the public access to spaces which were once open, in some cases the difficulties arise from lack of knowledge of both trends and the management necessary to cope with them. Others are infuriated by visitor's carelessness or their failure to contribute to upkeep costs. The point of the leisure boom is that a mass of people cannot enjoy, in the same places and at the same time, the pleasures that once a few enjoyed. As demand increases, so must planning and consideration for others.[15]

If this opportunity for unorganized, informal recreation is to remain in the future, steps must be taken now to identify, protect, and preserve those things deemed important by the recreating public.

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[15] Arvill, op. cit., p. 78.

E. H. Graham was one of the first to apply ecological methods to land use. His book, The Natural Principles of Land Use was published in 1944. In the introduction of this work he states, "to think wisely of the future use of land, we must first look carefully at its past, for a knowledge of what has caused a landscape helps materially in judging its future."[16] Graham, however, was not concerned with recreation as a specific land use. Recently, William J. Hart has made just such a suggestion. In respect to cities and their suburbs he describes what he calls "functional open space". By Hart's definition "functional open space means that the location, extent and shape of open space for parks, buffer zones and green corridors is treated as a land use on the same terms as residential, commercial and industrial zones."[17] But, "it does not mean, however, that sites of national importance should be forced into servicing urban crowds but rather that alternative sites should be found to divert urban pressure from the fragile areas".[18] Many authorities reiterate this point. There is a dirth of recreational areas adjacent to centres of population and hence, in some cases, national parks are forced into the position of serving a local function. The Study Group No. 6, "Outdoor Recreation: Active and Passive" for the Second Conference on The Countryside in 1970 put it this way:

> The location of intensive recreation areas close to potential users is of paramount importance as the deficiencies are all the more appalling when the distribution of the existing areas is taken into consideration. We believe a new

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[16] E. H. Graham, Natural Principles of Land Use (New York: Oxford University Press, 1944), p. 3.

[17] William J. Hart, A Systems Approach to Park Planning (Morges, Switzerland: International Union for the Conservation of Nature and Natural Resources, 1966), p. 44.

[18] Ibid.

> attitude towards the concept of public open space is required if we are to retrieve something of the lost balance between town and country and divert away from the countryside some of the intensive pressures for man-made forms of recreation facilities which fall upon it.[19]

How do we know what to develop? And knowing that, where do we develop it?

Some techniques, basically ecologically oriented, have been developed to try to answer these questions. Of these, the approach of Philip Lewis of the University of Wisconsin, is probably the only one developed specifically in response to outdoor recreation. The main innovation Lewis has brought to this whole area is that the basis of his approach lies in a selected inventory which is conducted in a very particular way. He makes no attempt to rate, qualify or find priorities for a study area before he has accumulated, sifted and ordered a complete inventory of both cultural and natural resources.

In the Wisconsin study three major resources were identified and mapped at the same scale so that by a system of overlays they could be superimposed on one another. When this was done, the significant topography, surface water and wetlands, combined to form large linear patterns which Lewis called an "environmental corridor."

> In our first phase, we called these patterns 'Environmental Corridors'. These are the basic research units for recreational planning. Once inventoried and mapped, they encourage planning for total environmental development, rather than for piecemeal and perhaps haphazard development - a picnic table here, observation

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[19] The Countryside in 1970 Second Conference (London: The Royal Society of Arts, 1965), p. 6 .8.

> point there, and private or inharmonious use of scenic areas in between. An observation tower overlooking a poorly-developed suburb that once was a pleasant valley is hardly worth visiting - particularly if the traveller must drive through a suburb just like his own to get there.[20]

Beyond these major resources an extensive list of "additional landscape resources for recreation"[21] were also inventoried and mapped. In doing this experts from a variety of other fields were employed. This is another distinctive aspect of Lewis' work.

> Above all, this was a team effort, for no single professional discipline, in our opinion, is able adequately to evaluate and interrelate the many aspects of a regional landscape which, combined, produce an invaluable recreational resource.[22]

Such an inventory, when done at a state or province wide level, would form a sound basis for the development of a list of areas to receive priority for detailed study. Many unique and irreplaceable areas would show up once the initial inventory was complete and action could then be taken, in the proper context for there would be a basis of comparison, for their immediate preservation.

The two others whose work was also reviewed by the Harvard group (see footnote 21) were Angus Hills, and Ian McHarg. While Lewis' work was initiated with recreation in mind, that of Hills and McHarg was not. It is

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[20] Lewis, op. cit., p. 103.

[21] Landscape Architecture Research Office, Graduate School of Design, Harvard University; Three Approaches to Environmental Resource Analysis (Washington: The Conservation Foundation, 1967), p. 43.

now recognized, however, that Lewis' work has much broader applications than just recreation alone.

Hills' system was developed within the Department of Lands and Forests of the Province of Ontario in response to their program "in multiple-resource planning."[23] It grew out of the author's work in forest management and was "expanded to cover all types of biological production."[24] By studying the present and past uses of specific areas, that is, by comparing similar physiographic types, Hills developed a "use-capability rating" for the various categories. Though his main aim was a land-use framework based on ecological principles, he did within that context, consider recreation.

Unlike Lewis, who acknowledges the cultural landscape, Hills is concerned chiefly with the land itself. He considers its biological productivity in relation to the use man desires to put the land to.

> Although man-management may dominate the planning of considerable areas of the national and provincial parks, forest and wildlife management must remain the basic management....The maintenance of vegetative cover, even under the strain of dense human occupance, is one of the main objectives of recreational land management.[25]

The inventory concept is not inherent in Hills' system, which in many respects is more detailed and therefore more time consuming to apply, than Lewis'. Being more detailed it does not lend itself as readily to state or province-wide application.

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[23] G. A. Hills, The Ecological Basis for Land-Use Planning (Research Report No. 40, Ontario Department of Lands & Forests, 1961), p. 2.

[24] Ibid.

[25] Ibid., p. 124.

Ian McHarg approaches the subject from the position of a practising planner. His interest is in "a method which has the power to reveal nature as process, containing intrinsic form,"[26] and he further states; "I believe that ecology provides the single indispensible basis for landscape architecture and regional planning."[27] He has actively pursued this position in his work, as was revealed above in reference to plan for Green Spring and Worthington Valleys.

> The Plan for the Valleys depends exclusively upon physiographic determinism to reveal the optimum pattern of development. This concept is yet another aspect of the report having wide relevance to problems of development. In short, physiographic determinism suggests that development should respond to the operation of natural processes.[28]

It is interesting to note that both McHarg and Lewis advocate limited development on flood plains and the protection of marshlands so that they may perform their natural role as major water storage areas. Compatible with that function, however, is their use for a variety of recreational purposes.

McHarg is convinced that a considerable portion of the damage done by the storm of March, 1962 to the New Jersey coast was the direct result of ignoring available ecological information in the development of that area.

Sand dunes are a natural occurance along that part of the Atlantic Coast. A special kind of vegetation adapted to that habitat invades the

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[26]Ian McHarg, "An Ecological Method for Landscape Architecture", Landscape Architecture, Vol. 57. No. 2. (January, 1967), p. 105.

[27]Ibid.

[28]Ian L. McHarg and David A. Wallace, "Plan for the Valleys vs. Spectre of Uncontrolled Growth", Landscape Architecture, Vol. 55. No. 3. (April, 1965), p. 179.

bare dune and gradually complete vegetal cover is established. Once this is accomplished the dune system functions as a natural protective barrier between the land and the sea. In this case the sand dunes were breached, built-on, and generally misused so that the vegetation died. They became unstable and when the storm struck, "the consequences were inevitable; with its natural defenses destroyed, the shore was vulnerable and was extensively damaged."[29]

The understanding of the dune ecosystem is not only of importance in controlling coastal erosion. On popular bathing beaches backed by dunes that have been stabilized by vegetation, the degree to which the vegetation will withstand trampling must be ascertained. Since the process of succession unfolds slowly from the time the bare sand is first invaded by the pioneer plants, it must also be understood in order to determine the vulnerability of any one stage to human use. This succession from bare uncolonized ground is termed a "prisere" by Chapman.

Dune restoration work has been undertaken along the coast of the County of East Lothian near Edinburgh, Scotland. The coastline, some forty-two miles eastward from Edinburgh, has suffered a variety of abuses over the years. A larger and more mobile population from around Edinburgh made more demands on the same area for outdoor recreation. This, as well as coastal erosion, made the restoration work necessary. Two important factors showed up; one, that the total number of people allowable in a given area was directly related to the amount and stage of development of the vegetation

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[29]Ian McHarg, "Ecological Determinism", The Future Environments of North America (New York: The Natural History Press, 1966), p. 534.

and two, that the movement of these people had to be restricted to marked paths.

> The increased use of this stretch of coastline by Edinburgh people is being met by increasing the capacity of the dunes by this planting and is controlled by the size of the car parks, which are gradually extended as the dunes area is secured, but there is a limit to this. In order to limit the traffic along the coast road, proposals are being canvassed for constructing a main arterial road inland and forming the coast road into loops and culs-de-sac to which entry can be controlled when necessary. This also has the advantage of avoiding costly coastal road works and the severing of villages from their beaches.[30]

Though, in this case, development is minimal and related to outdoor recreation, the concept on which it is based bears a strong resemblance to McHarg's idea of the morphology of development being revealed by ecological analysis.[31]

The importance of the work of Lewis, Hills and McHarg lies in the fact that each of them in his own way has recognized and responded to natural ecosystems. They have actively endeavoured to relate man and his works to them. They have acknowledged man as the chief ecological force of change in the world to-day. But, at the same time, they have respected the need to know and understand natural systems before imposing the artificial systems of man upon them.

> These men offer hope precisely because they presuppose a unity in nature, into which man fits as something less than a smothering

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[30] F. P. Tindall(M), "The Care of a Coastline", Journal of the Town Planning Institute, Vol. 53. No. 9.,(November, 1967), p. 389.

[31] McHarg, op. cit., p. 535.

> colossus. They explain in a sense not only why man does not stand alone, but also why he must not try to do so.[32]

The contribution of W. J. Hart has been specifically in the field of park planning. His main premise is that parks in a given area, of all kinds and sizes "are related to each other, to the use of resources in the landscape which includes them, and to the society which supports them."[33] They form a complete system. But there already are national park "systems", provincial park "systems" and municipal park "systems", however;

> Such systems do not represent park systems as conceived of in this study. Each system is based on a single rationale which sets the standards for each individual park in the system and each park is usually considered only in terms of the criteria of its own system. The result is the traditional approach to parks - each one is a separate, discrete unit in space and time and is unrelated to other types of parks which may exist in the same region. Yet every land unit, no matter how large or small, bears some relation to all other land units within some logically defined region around it. In reality, what happens outside the boundaries of a given park is often as important - perhaps more important - as what happens inside the boundaries, particularly in terms of habitat protection. Each park within each system bears a relationship to the other parks in other systems and to use patterns of the land in which all the parks are situated.[34]

The Everglades National Park is an excellent example of the importance of events outside of park boundaries. In 1947 a large project was undertaken by the United States Corps of Army Engineers in order to control the flow

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[32]Daniel McKinley, "The True Wealth of Nations: The Need for an Ecological Conscience", Landscape, (Autumn, 1962), p. 16.

[33]Hart, op. cit., p. xi.

[34]Ibid., p. 3.

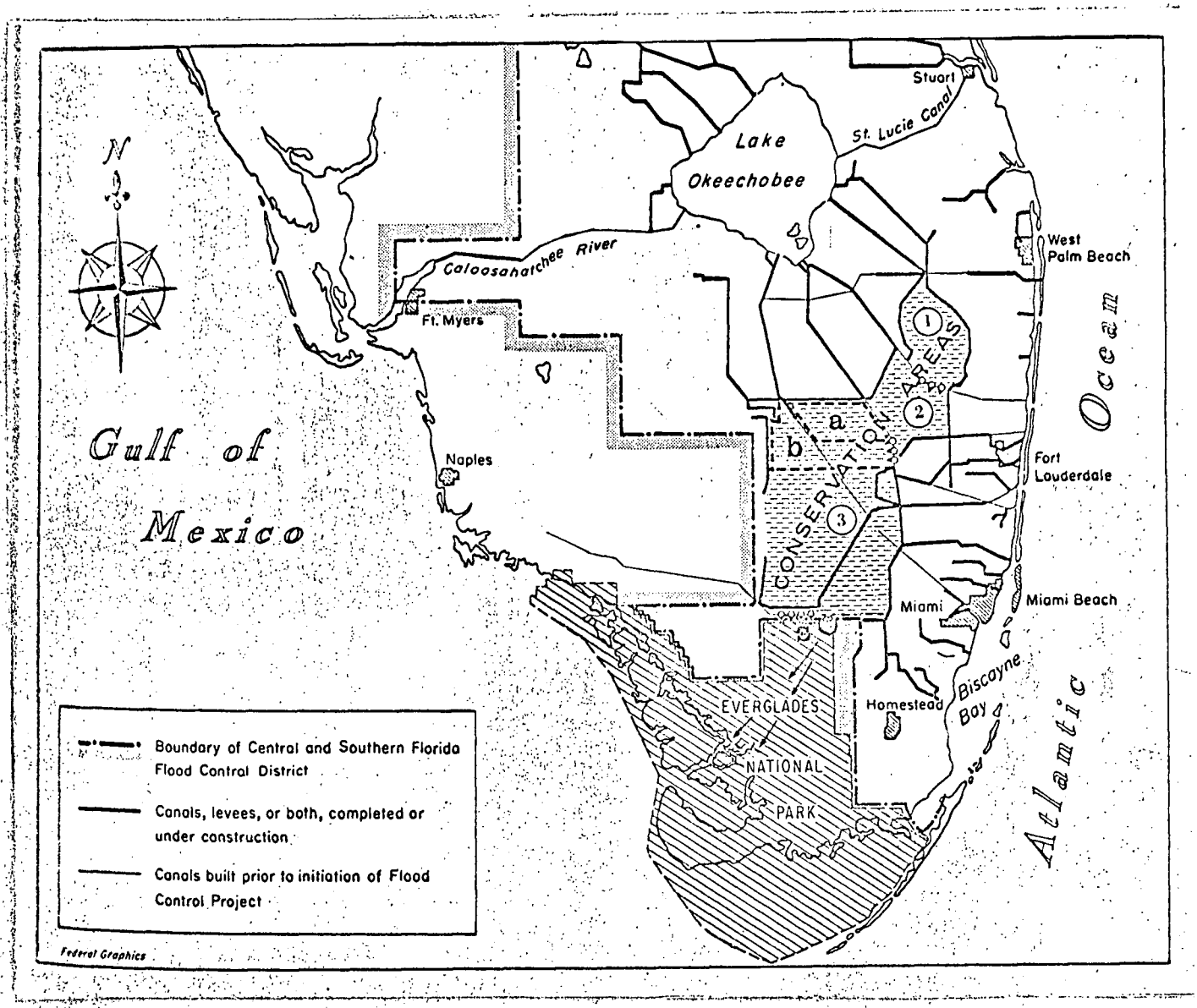

Figure 7 Everglades National Park (Source; Nat. Parks Magazine, Aug.,1965, p.9)

of water from Lake Okeechobee, the source of water for the Everglades. Its purpose was to prevent flooding and provide water for agricultural and municipal use. There followed a complicated bureaucratic entanglement involving the Federal Government, the Department of the Interior, the National Park Service, the Corps of Engineers, the State of Florida and, a state agency possessing autonomous power, the Central and Southern Florida Flood Control District (see Figure 7). The value and needs of the park were somehow sublimated and "to this day no written agreement exists between the State of Florida and the Federal Government to provide the assurance of a minimum supply of fresh water for the park."[35] Since 1961, when a cycle of dry weather began, conditions in the park have deteriorated yearly. Stanley Joseph, the park superintendent set the minimum annual requirements of the park at "250,000 acre-feet of water - an amount equal to the average flow over the past twenty years."[36] The United States Geological Survey reported that over the years 1963-65 more than 1,500,000 acre-feet of water not needed for agricultural or municipal use, was released into the sea. Yet, in the park in 1965, emergency pumping measures had to be undertaken in order to prevent complete loss of certain areas. The life and quality of the park were affected by actions taken outside its boundaries and by the inability of a number of organizations to agree on a solution. Its future is still threatened by the slowness of the political system to respond to a situation

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[35]Michael Straight, "The Water Picture in Everglades National Park", National Parks Magazine, Vol. 39. No. 215. (August, 1965), p. 6.

[36]Ibid.

that requires immediate action.

Though Hart uses the broader term, biological factors, the biological problems are mainly cast in an ecological context. Along with the biological, the other two basic factors of concern are, physical and social. These three combine to "affect the location, size and management of parks and other reserves."[37] But, where the biological factors determine the location of a particular park, they should also determine the size and management. A park conceived to protect a rare specie of large mammal must take its natural range into consideration when the size of the park is set. Otherwise, the result will be nothing more than an open air zoo with all the intensive and expensive management problems peculiar to zoos.

A broad picture of the wildlife and gross vegetation of an area can be gained by what Fraser Darling calls an "ecological reconnaissance". He and Starker Leopold carried out such a survey of Alaska during a four month period in 1952, "collecting nothing, making no tests, but just using such power of comparative observation as we possessed."[38] Their investigation revealed some interesting relationships between the caribou, moose and vegetation. This will be discussed later in the portion of the chapter on wildlife. What is of interest here is the technique itself. It does require specialists but as a means of obtaining a gross picture in ecological terms of conditions in a given area it has considerable merit. Such surveys have since been successfully carried out in Africa and Mexico.

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[37] Hart, op. cit., p. 3.

[38] F. Fraser Darling, "Conservation and Ecological Theory", British Ecological Society Jubilee Symposium, MacFadyen and Newbould (eds.) (March, 1964), p. 42.

> The ecological reconnaissance is an economical tool which governments have been slow to adopt. The expenditure of a few thousands of pounds on ecological reconnaissance in Tanganyika might have saved many millions in the catastrophic groundnut scheme.[39]

In some respects the ecological reconnaissance is a kind of modified, gross inventory. Inventories were the first step in the work of both Lewis and McHarg. It is a logical prerequisite to any kind of planning for any purpose whatsoever. McHarg is careful to point out, that even though the resource inventory material is mapped, it can in no way be construed to be a plan for "it does not contain any information of demand."[40] If an inventory is undertaken at all, several factors may act as restraints. These may include such things as the length of time available for research, the accessibility of data, budgetary restraints, and the amount of technical skill required. The process is fundamental to whatever follows, and careful consideration should be given firstly; to doing an inventory and secondly, to the method used.

In the context of planning for outdoor recreation the need to possess an overview of the region or province such as that provided by one of the above methods, is of primary importance and preliminary to any more detailed work. The systematised accumulation of environmental information can then be reviewed in the light of population distribution and the demands of the public for specific outdoor recreation facilities. Philip Lewis

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[39] Darling, op. cit., p. 42.

[40] Ian McHarg, "An Ecological Method for Landscape Architecture," Landscape Architecture, Vol. 57. No. 2. (January, 1967), p. 106.

includes cultural resources as well in his inventory, so that relationships can be established with the natural features at the same time. Unique natural and historical features are duely recorded allowing for priorities of acquisition and development to be established.

If no such surveys are completed prior to the designation of facilities the result is likely to be what Lewis calls "scatter-shot programs" of recreation development.

Water, Wildlife and Vegetation

Water, wildlife and vegetation are three components of outdoor recreation particularly subject to ecological disturbance. Each one will be examined and some ecological features important to planning for outdoor recreation will be emphasized.

Water

Water seems to be the most significant, single element in the outdoor recreation experience of a great many people.

> Whether they go to the coast or stay inland, the greatest number of active recreationists need water on which to boat, canoe, dive, sail, swim or water-ski. Even more enjoy viewing the 'waterscape'. And this is universal. The Rockefeller Report[41] showed clearly that water is the focal point of much active recreation.[42]

It is consistently rated highly in user surveys.

> Every recreation survey emphasizes the importance of water. It was found that in most U.S.A. and Canadian parks some form

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[41]The Rockefeller Report is another name for the report of the Outdoor Recreation Resources Review Commission.

[42]Arvill, op. cit., p. 81.

> of water proved to be the most critical single factor used or enjoyed by 70%-80% of park visitors.[43]

Though in many cases it is not used directly, great value is placed on it as an element of the "scenery". One of the great "booms" of recent years has been in the general area of water-based activities. Sports such as water skiing require large acreages and for reasons of public safety the numbers must be limited once a certain threshold is reached.

The first important point to consider about water is that in most cases it represents a biotic community which is dependent on a particular combination of physical, chemical and biological factors. In a river, for instance, these factors are not uniform. Various combinations occur in in rapids, riffles, pools or slow deep stretches of a river. The main differences between running water or lotic communities and standing water or lentic communities are the effects of current, depth, and oxygen.

The current is a direct function of the gradient of the stream and is one of the main limiting factors in streams. There is usually much greater variability of depth in streams, than ponds, consequently wide fluctuation of temperature occurs. When the effects of current and depth are combined in the stream the resultant is a community that is more dependent on the substrate and surrounding land for supplies of nutrients.

In lentic communities oxygen and chemical constituents are subject to stratification, as opposed to almost complete mixing in the lotic.

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[43]Eugene Mattyasovsky, "Recreation Area Planning: Some Physical and Ecological Requirements", Plan, Vol. 8. No. 3. (1967), p. 100.

Table 5

Longtitudinal Distribution of Fishes in Little Stony Creek

Stations	1	2	3	4	5	6	7	8	9	10	11	12	13	14
pH	5.6	5.6	5.8	5.8	5.9	6.2	6.4	6.6	7.0	7.0	7.1	7.2	7.2	7.4
Temperature(°C)	15	15	16	16	17	18	18	18	18	19	19	20	20	21
Salvelinus f. fontinalis	X	X	X	X	X	X	X	X	X	X				
Rhinichthys atratulus obtusis					X	X	X		X					
Catonotis f. flabellaris							X			X			X	X
Salmo gairdnerii irideus								X	X	X	X	X	X	X
Cottus b. bairdii												X	X	X
Campostoma anomalum													X	X
Notropis albeolus														X
Rhinichthys cataractae														X
Catostomus c. commersonnii														X

(Source; Odum, Table 18, p. 325)

Zonation in ponds or lakes tends to be horizontal in response to the stratification factor and longtitudinal in streams in response to current and depth. (see Table 5)

The above biological conditions are very important in considering more intensive use of a good fishing stream or lake for other activities. Since some species, such as Notropis albeolus in the preceding table, respond only to a narrow range of environmental conditions these other uses must be carefully chosen and integrated to preserve their habitat.

For outdoor recreation use, water quality has many facets. The requirements of fishing, swimming and boating are not the same. Questions of public health also arise and these are often related to the separate problem of water pollution.

The term "pollution" is frequently used to describe a deteriorated or undesirable condition of land, air or water. It is commonly used but does not, as yet, have a precise definition. The term "polluted water", says Mattayasovsky, "covers a wide range of quality conditions, according to the causes of the pollution, the so-called pollutants".[44] Fosdick defines pollution as "a resource that is out of place, since substances that are considered undesirable pollutants under some circumstances may be valuable under others..."[45] He goes on to describe two catagories of such substances, natural materials such as dust or silt, and those "created by man, such as sewage, the sprays of agriculture, and junk piles."[46]

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[44] Mattyasovsky, op. cit., p. 106.

[45] Ellery R. Fosdick, "The Pollution of Man's Environment", National Parks Magazine, Vol. 40. No. 228. (September, 1966), p. 16.

[46] Ibid.

Pollution arises in many ways. Silting of streams can occur as the result of erosion or from mining, logging or other industrial enterprises. Once in the stream, these suspended solids are carried for long distances and may actually destroy the aquatic life.

A wide range of industrial wastes as well as domestic sewage also contribute to the lowering of water quality. This effect is by no means uniform and to a great extent is dependent on the relative size and rate of flow of the receiving stream or river. Pollution occurs when the natural system can no longer dilute, or decompose the pollutants at a rate which keeps them below their specific levels of toxicity, or the level at which they begin to reduce the oxygen content of the water. Two fairly recent problems are stream or lake contamination by pesticides carried into them in run off from adjacent agricultural land or forest spraying and algal blooms in water bodies receiving "clean" effluents, which are high in nutrients, from sewage lagoons. Both of these were reported this past summer in the local press as having occurred in Skaha and Okanagan Lakes in the British Columbia interior. In this case, the pollutants were sprays used in the orchards of the area and washed into the lakes during runoff, and nutrient rich effluent from local sewage lagoons. Douglas records the case of enormous fish kills in the Mississippi River between 1960 and 1963. On investigation, "scientists discovered that the pesticide endrin, used in sugar cane fields to kill the sugar cane borer, was responsible"[47] for killing the fish.

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[47]Douglas, op. cit., p. 113.

Lakes or streams with wide seasonal fluctuations in level are of low recreational value unless it is feasible to develop artificial stabilizing devices. This has also been a problem with recreational use of reservoirs. The period of intense recreational use coincides with the period of greatest draw down on the reservoir. Sometimes there are also problems of developing the shoreline of a reservoir.

Water clarity, freedom from microscopic pests or weeds, water remperature, and slope and condition of the bottom are the critical factors in swimming areas.

Water oriented outdoor recreation responds not only to the amount of water but also to its various forms. The physical sizes of lakes and streams determine, only to a limited extent, their recreational use.

> We are forced to conclude that water quality is one of the most important limiting factors in recreational use. Quality of water exercises this control through its effect on the quality of the experience. It is the quality of the experience that makes outdoor recreation one of the important pursuits in a civilized existence.[48]

Water quality is a question of the inter-relationships between physical, chemical and biological factors. Before much can be done to control quality a clear understanding of the original condition must be gained. Then not only the direction of change can be identified but quite possibly the elements as well. Restoration of a completely deteriorated system requires much time and a great deal of money and in some cases the original conditions can never be duplicated.

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[48] U.S. ORRRC, Water for Recreation - Values and Opportunities (Study Report #10, Washington: G.P.O., 1962), p. 54.

Vegetation

Vegetation along with the actual land form itself is the commonest feature in the outdoor recreation experience. It is so common and taken for granted that concern for it often does not arise until major changes have occurred. The emphasis on the "natural" environment by recreationists refers mainly to the vegetation. Yet few areas exist in their original, natural, indigenous vegetal cover undisturbed by man, around centers of population or the inhabited countryside.

For example, Arvill points out that in England, citizen and tourist alike accept grassland and heath as part of the "natural countryside.

> But their naturalness and unity are only in the mind of the user...The chalk and limestone grasslands of England are of special importance as attractive open spaces for the urban dweller. Few appreciate that they are an artefact - a man-made creation - and that their continuance depends upon management.[49]

The idea of management seems to create considerable consternation amongst certain groups of users. They associate it with artificiality and so do not want it in the "wild" of "natural" areas. Unfortunately they do not realize that the continued existence of many areas depends on management or manipulations of the governing factors by qualified personnel. According to Stone "management consists merely of those actions that are necessary to achieve one or more objectives, whatever they may be, even if the objective is 'no management'".[50] Stone has developed an outline of the

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[49] Arvill, op. cit., p. 171.

[50] Edward C. Stone, "Preserving Vegetation in Parks and Wilderness", Science, Vol. 150 (December 3, 1965), p. 1264.

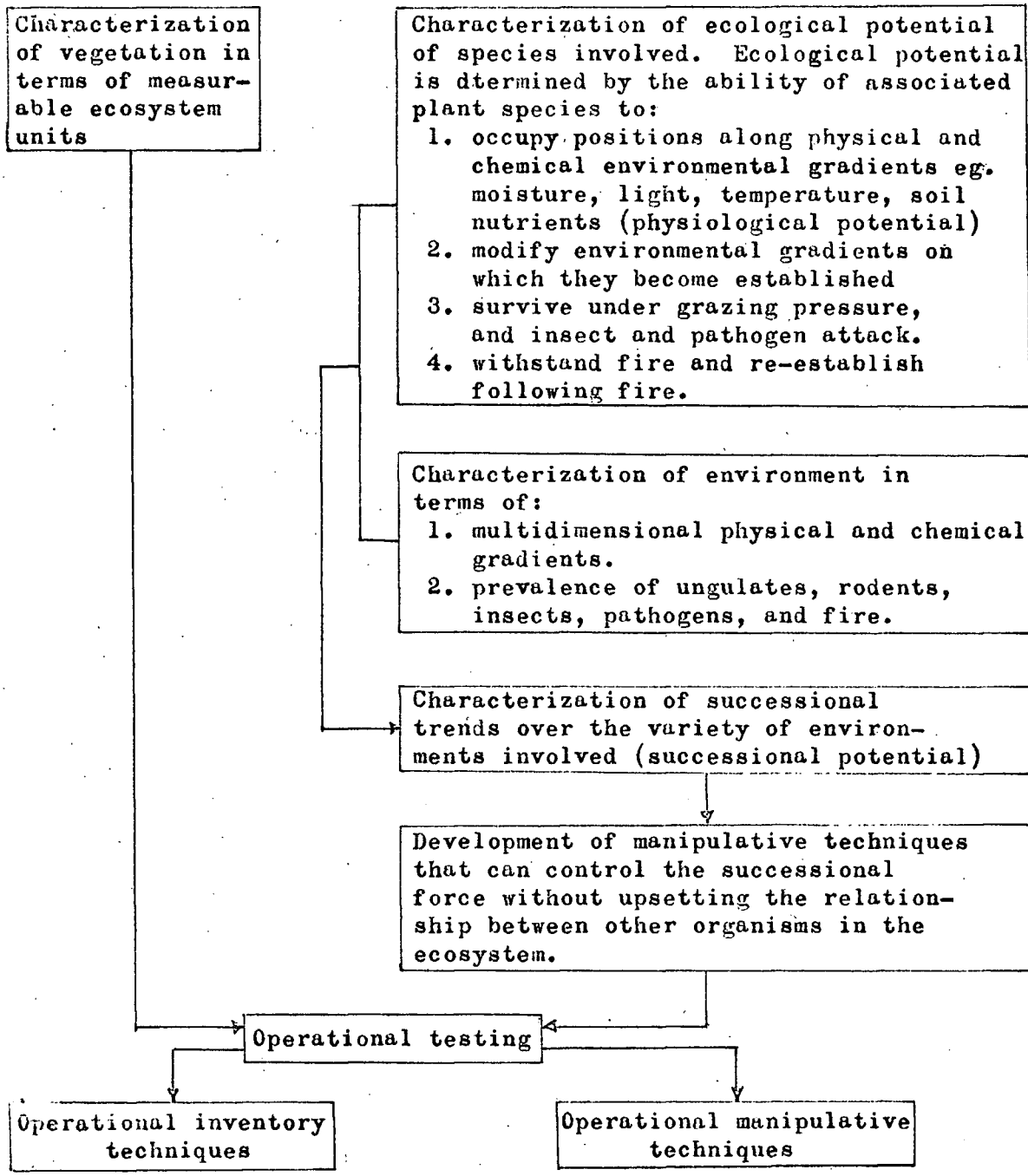

Figure 8 Information required to develop manipulative techniques for vegetation

(Source; Stone, Science, Vol.150, Dec., 1965, p.1262)

information required for such management. (see Figure 8)

A. W. Kuchler has advocated the mapping of the vegetation of the entire United States. He maintains that the State of Wisconsin has progressed further than any other state in this respect. A map of the existing vegetation in selected regions is necessary to accomplish any management aims. For most areas, such information is just not available.

Though it was stated earlier that the fauna usually follow the flora, this was not meant to imply the strict independency of plants and dependency of animals. The two interact and are to a certain degree, interdependent. Large ungulates can affect the process of succession by overbrowsing if their numbers exceed the carrying capacity of their range. Many plant seeds are disseminated by animals. The presence of particular animals can influence or favour a particular plant association or community.

It is important to remember that vegetation forms an extremely high proportion of the habitat of most terrestrial animals. If the animals themselves are considered of value, their habitat must be maintained. The vegetation is sometimes directly affected by man's ignorance or carelessness, but on some occasions it is affected indirectly by other actions. Compaction of the soil has already been mentioned, either by men or machines. Lowering of the water table and pollution of the air also contribute to vegetation loss.

Certain ecosystems, such as marshlands, dune and alpine flora are extremely fragile. This must be recognized if they are to be incorporated successfully into an outdoor recreation system.

Wildlife

Apart from the function of the fauna in helping to maintain stability in ecosystems, certain groups, particularly the larger birds and mammals, are an important component in the outdoor scene for many recreationists. Whether they hunt, photograph, engage in wildlife study or just like to "look", - "in some way, most people have an interest in wildlife."[51]

Many species of animals have become extinct, Arvill quotes Dr. Ian McTaggart Cowan as saying that "in nineteen hundred years, the world has lost 107 mammals and close on 100 kinds of birds."[52] Extinction itself is a natural process, the question is for how many of the above losses was man directly responsible.

> Of all wildlife species on the continent the most numerous was the passenger pigeon. At the beginning of the nineteenth century the number of these birds was estimated to be an incredible 5,000,000,000. Around 1810, Ornithologist Alexander Wilson reported sighting in Kentucky a single flock which was a mile wide and 240 miles long, containing, he guessed more than 2,000,000,000 birds. It is likely that these prolific pigeons then constituted about a third of the entire bird population of the United States.
>
> Succulent and easy to kill, they were shipped by the carload to city markets, and some farmers used them for hog feed. It was inevitable that these vast flocks would be depleted. They were an easy mark for the hunters, and the forest levelers were destroying their habitat. Ultimately, however, the passenger pigeons were not depleted - they were exterminated. At the end of the nineteenth century there was

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[51] Arvill, op. cit., p. 143.

[52] Ibid., p. 142.

> not one to be seen, and a few years later the last survivor of the species died in the Cincinnati zoo.[53]

No one thought it possible that a bird so numerous could be wiped out. The buffalo, also extremely numerous, almost met the same fate.

To preserve selected species is not, as first thought just the simple matter of protecting them from their natural enemies. The habitat itself must be managed and protected. The range of the animals and whether or not they migrate is also important. To protect and provide feeding grounds, on one hand, and then turn around and destroy breeding grounds, on the other, serves no purpose whatsoever. The problem must be faced in its ecological context.

During the ecological reconnaissance of Alaska, conducted by Leopold and Darling, an interesting relationship was discovered between moose, caribou and vegetation. Man and predators had long been held responsible for the great reduction in caribou herds. Leopold and Darling pointed out, however, "that the caribou was a creature of climax vegetation - the lichen tundra - and the moose one of mid-successional vegetation."[54] Once this climax vegetation was destroyed, due to fire, overgrazing and other causes, it was followed by the scrub growth of mid-successional vegetation. Thus the range of the caribou was further reduced while that of the moose was extended. This is an excellent example of a case where "conservation of the

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[53]Stewart C. Udall, The Quiet Crisis (New York: Avon Books, 1964), p. 75.

[54]Darling, op. cit., p. 42.

range should be dominant over conservation of the individual animal, not the other way around".[55]

Darling, Huxley and others have argued that man has a responsibility to protect wildlife in its natural state by the mere fact that it exists. Fosberg, Sears, Bates and others have emphasized through their work in ecosystem ecology, as shown in Chapter III, that one of their tentative conclusions is that variety in natural ecosystems is an indication of stability. This stability affords the ecosystem the ability to withstand disturbances, either natural or artificial, and return to its original condition. Variety in ecosystems seems to indicate stability; simplicity, instability. This is another, more vital reason, for the preservation of wildlife. Of more interest here though is the fact that animals are very much a part of the outdoors and the quality of the outdoor experience would be degraded were once familiar animals only to be found in zoos.

Summary

This chapter has sought to show the fundamental importance of ecological information to the outdoor recreation planning process. The facts are that in the past little of the information available has been utilized and even now is not used to the extent it should be.

The discussion was presented in three sections. The first considered the historical aspects of the park concept in relation to planning. Then the concept of an "ecological point of view" was discussed as a basic approach to the planning for outdoor recreation. Ian McHarg is representative of this approach. He is not specifically concerned with recreation; however,

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[55]A. Starker Leopold and F. Fraser Darling, Wildlife in Alaska: A Ecological Reconnaissance (New York: The Ronald Press, 1953), p. 112.

he has carried the approach further and applied it to planning as a whole. Artur Glikson[56] is also one of the few planners to recognize and actively use such information in his work.

The third section pointed out three areas where ecological processes could be critical. There are areas where specialists in such disciplines as limnology, botany or game management might need to be consulted. In such instances the planner should consult them before development occurs or at least make them part of the on-going process of the development itself. To commit errors out of ignorance and then call in the appropriate consultant to repair the damage is a particularly dangerous technique. In the case of natural ecosystems it can be disastrous since a point can quickly be reached where restoration is either biologically or economically impossible.

Biological information must form an input in the process of planning for outdoor recreation just as social and economic information now do. That planning is unquestionably done for the benefit of people is implicit, but if it is to be done well it must be done in the light of as complete a knowledge of the natural environment as science can make available. The planning process must also be prepared to adapt as new fields of knowledge are uncovered and not remain a static approach to what is already known to be a process composed of an immense number of interacting, interdependent dynamic systems.

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[56] Artur Glikson, Regional Planning and Development (Leiden: A. W. Sijthoff's Uitgeversmaatscappij N. V., 1955)

CHAPTER V

SUMMARY AND CONCLUSION

This study started by considering the broad relationships between man and nature which have evolved through history as man's association with the natural world has changed through the development of civilization and technology. The progression of man from the position of a minor influent[1] on the natural world to his position to-day as the major ecological force has not been uniform. The rate of change began to increase with the industrial revolution. Until that time man's world, civilized or otherwise, was largely ordered by the natural processes of the seasons and the daily rising and setting of the sun. Time, except in those terms, had very little importance. But, as Nels Anderson pointed out, a drastic change occurred with the general regulation of the day by the hours, minutes and seconds of the clock. The whole cycle of life was reoriented to this and the production techniques of the industrial revolution. The machines could go on twenty-four hours a day, only their human attendants and operators required rest.

Cities became centres of attraction and consequently they grew both in number and size. Rural life and ethic were broken but were replaced by nothing but the dirt, disease and degradation of the nineteenth century industrial city. The trend continued and continues even to-day. Modern cities

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[1] The term is used here in the animal ecology sense of an animal having a "minor influence" on a habitat as opposed to being a "dominant".

are larger and better, to a degree, than their nineteenth century counterparts. Ian McHarg feels that: "cities are probably the most inhuman environments ever made by man for man. It is taking the best efforts of modern medicine and social legislation to ameliorate the abuses which the physical environment imposes on us."[2] However, urban dwellers to-day do enjoy better living and working conditions than in the past and have time for other things.

Recreational needs can, to a certain degree, be fulfilled within the urban centres. However, as cities grow it becomes more and more difficult to satisfy outdoor recreational needs within their boundaries. But, there also appears to be a biological "need" to seek out the natural countryside for "re-creative" purposes. It has already been established that increasing population, leisure time, disposable income and mobility are prime factors in the phenomenal increase in the demand for recreation facilities of all kinds. Outdoor recreation is no exception. Many new activities have appeared. In 1958 when John Steinbeck set out on the journey which he recorded in Travels With Charley he had to have the camper unit custom-made for his truck. To-day, barely ten years later, there are over a thousand manufacturers of camper units in the United States and Canada.[3]

Attendance at National Parks (see Figure 6) has continued to increase and some are beginning to show signs of wear and tear. The unique and scenic areas preserved in National Parks are suffering ecological harm. The natural

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[2]Ian McHarg, "The Ecology of the City", A.I.A. Journal, Vol. XXXVIII No. 5.(November, 1962), p. 101.

[3]Dr. G. S. Sharpe, Lecture, Forestry 563, U.B.C., March 20, 1968.

environment itself is being degraded. But the recreation experience is doubly affected: first, by the degradation of the natural features and, second, by the appearance of too many people in the same place at the same time.

> It would appear, in short, that the rudimentary grades of outdoor recreation consume their resource-base; the higher grades, at least to a degree, create their own satisfactions with little or no attrition of land or life. It is the expansion of transport without a corresponding growth of perception that threatens us with qualitative bankruptcy of the recreational process. Recreational development is a job not of building roads into lovely country, but of building perceptivity into the still unlovely human mind.[4]

Large numbers of people are demanding recreation space and facilities. Supplies of land and water are finite and, in any case, there are a great many more uses to which land can be put to-day than in 1900. Nearly all non-urban land is controlled to a degree, for some purpose, be it agriculture, timber production, rights of way or airports. To accommodate all uses on the available land requires planning. To endeavour to do this and maintain a natural harmony in the landscape and, at the same time achieve maximum social gain requires a planning process rooted in ecological principles and concepts.

In outdoor recreation it is the natural environment that is of prime importance. The hypothesis in this study is that ecology is a basic factor in the planning for outdoor recreation. The evidence has been presented in the form of actual examples in their relation to ecological principles

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[4]Aldo Leopold, A Sand County Almanac (New York: The Oxford University Press, 1949), p. 176.

and concepts. Most of these are negative in that they represent situations which should not have occurred had ecological information been utilized. Very few examples have been found to support the positive position.

Two factors, apart from ecology yet bearing directly on it, make recreation planning difficult. These are space and time. Outdoor recreation is very much affected by seasonal variations. The coincidence of large numbers of people in space and time has already been mentioned in respect to national parks. Heavy use in summer months is to be expected, but how to cope with it is another problem. Thomas L. Burton showed, for instance, that seventy-eight percent of the Swedes compared with sixty percent of the Britons took annual vacations. But, more important is the fact that over eighty percent in both countries took their vacations between June and August.[5] Thus a great number of people expect to partake of similar experiences in a period of only three months. When this fact is coupled with the individual ability of each prospective recreationist to cover long distances during an annual vacation, the problems of predicting the numbers of visitors at a particular park or other attraction at a given time, are manifold. "At present, Americans indicate that they will exploit their mobility and spend their leisure in different setting where they can pursue a wide variety of activities."[6] Many countries have discovered that their recreational facilities, everything from parks and game reserves to beaches, ski slopes and commercial entertainment, are no longer just provincial or national in

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[5]Thomas L. Burton, "Outdoor Recreation in America, Sweden and Britain", Journal of Town and Country Planning, Vol. 34. No. 10.,(October, 1966.)

[6]Douglas H. Sessoms, "New Bases for Recreation Planning", Journal of the American Institute of Planners, Vol. XXX. No. 1. (February, 1964), p. 29.

scope, but international as well.

Planning for outdoor recreation must attempt to take the above mentioned problems into consideration. Unfortunately "outdoor recreation supplied to one person does diminish the amount supplied to other persons",[7] and "similarly, it can be argued that the point beyond which planned capacity is exceeded is the point also at which sharp quality deterioration sets in."[8] These points raise the question of limitations of use and the problems of establishing ecological criteria on which to base them. Even though "quality deterioration" is, in this case, the observation of an economist, its solution lies in the realm of ecology. Great recreational demand on resources, differentially distributed, and of variable type and quality poses many difficult problems in the planning for outdoor recreation.

Before even considering the system of parks proposed by Hart, the prime prerequisite to an adequate planning program is an inventory, at least as comprehensive as that of Philip Lewis. Hart contends that "the fundamental requirement for sound progress in park work on a national basis is an inventory of the natural and cultural attributes of the country."[9] He establishes the inventory as the necessary precondition to the development of an integrated system of parks, rather than the present situation where several "systems" are each concerned with their own criteria and development.

In Canada, it was not until 1965 that the inventory of recreation capability was started under the Land Inventory Divison of the Agriculture

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[7]Warren C. Robinson, "The Simple Economics of Public Outdoor Recreation", Land Economics, Vol. XLIII. No. 1., (February, 1967), p. 73.

[8]Ibid., p. 77.

[9]W. J. Hart, A Systems Approach to Park Planning (Morges, Switzerland: International Union for the Conservation of Nature and Natural Resources, 1966), p. 41.

and Rural Development Agreement (ARDA). Admittedly this is a nationwide program being co-ordinated and carried out by Federal-Provincial agreement. However, only a small portion of the country has been done and there is some question as to when the information will be available.

In the ARDA study "the basis of classification is the quantity of recreation which may be generated and sustained per unit area of land per year under perfect market conditions."[10] Lewis, however, has made a decision that topography, surface water and wetlands are the basic information required. This information is supplemented by recording other natural and cultural features of the landscape. A system of some two hundred symbols has been developed to represent these graphically. In this analysis Lewis is not concerned with capability.

The extent of detail allowable in such a survey will to a large extent depend on the time, staff and funds available. A less detailed and costly survey of the entire area concerned would be preferable to a detailed study of only a portion of it should the choice have to be made. This is, of course, assuming the area is relatively large and not of uniform topography and character. In such a case, or in a situation involving a large area and a low population, the ecological reconnaissance as used by Darling and Leopold may give a gross picture as well as indicate areas of concern. This would allow for the more costly and detailed studies to be done on a smaller scale.

The whole of Hart's exposition on "parks systems" is on a regional and national basis or scale. In the ensuing discussion of "region", Hart

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[10] Canada Land Inventory, Field Manual, Land Capability for Outdoor Recreation (Dept. of Forestry and Rural Development, June, 1967), p. 7.

makes the point that "in planning, use of regions tailored to specific needs is finding increasing favor as a basis of analysis."[11] He goes on to describe the dangers inherent in such a process when economic, social and physical problems form an indivisible complex.

> For park planning, the landscape region seems most relevant and has been used as a fundamental unit for analysis in a number of U.S. park planning studies. The landscape region is based on homogeneous land forms....Boundaries of regions may overlap political boundaries, or be truncated by them, depending on the nature of the planning problem and the perspective brought to the problem by the planner. More work may show that landscape regions have a significant correlation with many socio-economic factors which will make such regions even more valuable for recreation planning. At this stage, it seems evident that the landscape region has application to the analysis and resolution of many resource-use problems.[12]

The so-called "landscape region" is analogous to the larger areas defined by Hills, Lewis and McHarg. Hart, as shown in the above quotation, attributes considerable significance to it as a regional concept for resource-use. What is of importance here is the fact that ecological principles are a basic consideration in the designation of a landscape region. If it is to be used regionally for resource allocation, would it not be, in effect, functioning as the basis for regional planning?

Planning for outdoor recreation seems to be emerging as an activity of regional scale. This same impression is conveyed by the work of Artur Glikson who approaches recreational use of land as an integral part of the totality of regional planning.

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[12]Hart, op. cit., p. 43.

> Out of the theoretical development of, and the still very limited practical experience in, regional and town planning, the most important conclusion to be drawn with respect to planning for recreation is the need for comprehensiveness. Land-use planning for recreation should be comprehensive in the geographical sense.[13]

Glikson feels that it is impossible to supply the needed amount of land for recreational use at the regional scale if it is to be used exclusively for that purpose. His conclusion, while consonant with his own philosophy of regional planning, would not necessarily be acceptable to someone like Hart or to a national park service.

> Our conclusion therefore, is that the crisis of recreational land use can be solved only by opening up for recreational use the whole of the region. Nowhere should recreation be an exclusive function of an area; a landscape should be useful and beautiful at the same time - a resource of life and its renewal.[14]

Perhaps if development were to proceed as outlined in that particular paper by Mr. Glikson such a time would come when the designation "park" would be unnecessary and the whole landscape would emerge "as an inexhaustible resource of human recreation."[15] It must be stated, however, that in the thirteen years since the article was written little progress has been recorded in that direction. Examples have been cited in this paper to indicate that absolute losses have been incurred in some areas. Under these conditions

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[13] Artur Glikson, "Recreational Land Use", Man's Role in Changing the Face of the Earth, ed. W. H. Thomas (Chicago: University of Chicago Press, 1956), p. 904.

[14] Ibid., p. 906.

[15] Ibid., p. 912.

a system of parks, from the highly artificial user-oriented park of the city to strictly controlled wilderness areas, appears to be the only way of assuring at least partial fulfillment of the demand for outdoor recreation facilities.

Though Artur Glikson's work is concerned with "regional planning and development" his approach and philosophy evolve from a consideration of the land form, physiography and ecology. He defines the human environment "as a set of biological and physical facts in space, as modified by man."[16] The whole issue of recreation is within his context as a regional planner and receives equal treatment and consideration because of this intrinsic relationship. The relationship itself is established by Glikson's commitment to the ecological point of view and the resulting process is one of comprehensiveness, harmony and unity.

Though this study has been restricted in scope and depth to a review of some basic ecological principles in respect to planning for outdoor recreation, some interesting conclusions can be stated. The study was confined to an appraisal of existing literature in the fields of recreation, ecology and planning. No experimental or survey work or specific case study was undertaken. In order to support the hypothesis, data connected with all forms of development, not merely park or recreation development, were drawn upon.

During the study an interesting aspect emerged from the consideration of the work of both Artur Glikson and Ian McHarg. The concepts put

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[16]Artur Glikson, "Man's Relationship to His Environment", Man and His Environment, ed. G. Wolstenholme (Boston: Little Brown and Co., 1963), p. 132.

forth here as the basis of planning for outdoor recreation have, in their works, been extended to the regional planning process as a whole. A more detailed study of their work might prove to be very revealing, particularly in respect to the application, at the practical planning level, by a planner of ecological principles and concepts.

One distinct difficulty during the study was to separate the concept of planning for outdoor recreation from the totality of regional planning. By making this artificial separation explicit in the hypothesis there is a tendency to implicitly accept the idea that in reality an actual division exists. Both McHarg and Glikson indicate this is not so. The planning is of the totality not of the individual parts.

The evidence presented in the preceding chapters would seem to substantiate the following four conclusions.

1) Increases in population, mobility, leisure time and disposable income are contributing to a greatly increased demand for outdoor recreation. This demand, particularly in some areas, is not yet accurately predictable.

2) Finite resources of land and water are also experiencing increasing demands through increases in population and a multitude of factors associated with the general trend towards urbanization.

3) The natural environment[17] is the locale in which the outdoor recreation experience is satisfied. However, not all land and

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[17]The natural environment being the sum of the biotic and abiotic factors and the modifications brought upon them by man.

water is suitable for some forms of outdoor recreation. Certain elements, considered of high value by the recreationist, are almost totally regulated by natural processes which the science of ecology seeks to understand. These processes are affected both positively and negatively by the actions of man. Most of these actions are undertaken in complete ignorance of their short or long term effect on the natural systems. Some ecosystems, already reasonably well understood, are known to be very susceptible to change.

4) Many ecologists have agreed that one of the basic tentative conclusions to emerge from the study of ecosystem ecology is that optimum utilization of energy occurs in stable ecosystems and stable ecosystems usually exhibit complexity and diversity rather than simplicity and uniformity. McHarg summarizes these ideas concisely in the following table, under the headings of retrogression and evolution.

retrogression		evolution	
ill health	simplicity	health	complexity
	uniformity		diversity
	independence		interdependence (symbiosis)
	instability		stability (steady-state)
	low number of species		high number of species
	high entropy		low entropy

[18]

Furthermore, it has also been recognized that the actions of man tend to lead to simplicity in ecosystems. This is sometimes conciously done because it has been assumed that by simplifi-

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[18] Ian McHarg, "An Ecological Method for Landscape Architecture", Landscape Architecture, Vol. 57. No. 2. (January, 1967), p. 107.

> cation man is better able to control and utilize natural systems. The knowledge of ecosystems gained to date, though incomplete, indicates that this may be a very serious misconception that leads, as the above table shows, to retrogression instead of evolution.

Finally, in respect to the above conclusions, it must be remembered, as discussed in Chapter II, that recreation in any form whatsoever is a personal experience. Regardless of whether the event occurs when an individual is alone in a wilderness or with his family and hundreds of others on a beach, it is a personal event. It ultimately stimulates or "re-creates" the individual and a premium or little value is placed on it in respect to the amount of satisfaction that the person gains from it. If the event is an established practice, then by that fact alone, it will have a "quality expectation" attached to it. When this quality expectation is not met, as expected, the individual will become dissatisfied. He may seek to duplicate the experience elsewhere or may no longer indulge in that particular form of recreation. The ecological point of view applied to planning for outdoor recreation can help to alleviate conditions which might lead to the above situation.

The existing demand for outdoor recreation is not being met. Natural resource allocation continues to take place, for the most part, without respect to natural systems and the inherent capability of the land. Many fragile ecosystems presently designated for recreational uses are suffering from overuse and other such ecosystems of potential recreational use are being degraded either by misallocation or misuse.

Man is the paramount ecological force in the world to-day and must recognize his responsibility in this regard. The economic costs of totally disregarding natural processes in development of the earth for human habitation are only now being realized.

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