DEANS, CHARLES BALDWIN, JR.

UNCERTAINTY IN LANDSCAPE PLANNING AND DESIGN DECISIONS

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UNCERTAINTY IN LANDSCAPE PLANNING AND DESIGN DECISIONS

By

Charles Baldwin Deans, Jr.

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STATEMENT BY AUTHOR

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SIGNED Charles B Dean Jr

APPROVAL BY THESIS COMMITTEE

This thesis has been approved on the date shown below:

Michael M. McCarthy — May 14, 1982
MICHAEL M. McCARTHY, Thesis Director — Date
Associate Professor of Landscape Architecure

Donovan C. Wilkin — 5/14/82
DONOVAN C. WILKIN — Date
Associate Professor of Landscape Architecture

Roger Caldwell — 5/14/82
ROGER L. CALDWELL — Date
Professor of Soils, Water, and Engineering

"The unknown, the unforetold, the unproven, that is what life is based on. Ignorance is the ground of thought. Unproof is the ground of action. If it were proven that there is no God there would be no religion. But also if it were proven that there is a God, there would be no religion... Tell me, what is known? What is sure, predictable, inevitable - the one certain thing you know concerning your future and mine?"

"That we shall die."

"Yes. There's really only one question that can be answered and we already know the answer... The only thing that makes life possible is permanent, intolerable uncertainty: not knowing what comes next."

Ursula K. LeGuin

The Left Hand of Darkness

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ABSTRACT

A decision process for landscape planning and design lies in an understanding of the uncertainties inherent in the decisions planner/designers are confronted with; decisions concerning natural and cultural resource management, public perceptions and behavior, and environmental design. A decision process for landscape planning and design should be problem-centered, futures oriented, incorporate continuous learning and feedback mechanisms, allow for group processes and interactions, and be responsive to a changing decision environment. Two responses to the uncertainty in planning and design are presented which support this process; long term resource monitoring, and an interactive computer-based information exchange network. These two responses can provide a futures approach to planning and decisionmaking; for the collection of measurements and data to detect changes and determine trends; a process of continuous learning and feedback; and the integration and sharing of information resources.

CHAPTER 1

INTRODUCTION

Landscape architects in the past have relied on Design Theory as a basis for their decisions, but this theory alone is not adequate to meet the diverse responsibilities and functions of the landscape profession involved in larger issues of landscape planning and design. One response employed to the increasing complexity of planning and design decisions has been an "holistic approach" towards the environment. Holism, though, is not a process but rather an approach providing the context for a decision process to occur.

Recently, educators within the landscape profession.(Chenoweth, 1980;Koh,1980;Niemann,1980;Zube,1980;) have advocated the need for the creation of new knowledge through empirical research and theory studies on which to establish a defined decision process. A decision process should also build on existing theories and foundations. In the words of Einstein,

> ... creating new theory is not like destroying an old barn and erecting a skyscraper in its place. It is rather like climbing a mountain, gaining new and wider views, discovering unexpected connections between our starting point and its rich environment. But the point from which we started still exists and can still be seen although it appears smaller and forms a tiny part of our broader view gained by the mastery of the obstacles of our adventurous way. up (Zukav,1979)

The purpose of this thesis is to provide a direction for environmental planners/ designers in general and landscape architects in particular, towards increasing their ability for landscape planning and design decision-making. This purpose is based on the belief that there exists a lack of a decision process responding to the expanding role of the contemporary landscape architect. The objective is to demonstrate that a decision process for landscape planning and design be problem-centered, futures oriented, incorporate continuous learning and feedback systems, allow for group processes and interactions and be flexible to evolve in response to a changing environment.

This thesis postulates that a direction toward developing a decision process for the profession lies in an understanding of the uncertainties surrounding the decisions landscape planners and designers are confronted with; decisions concerning natural and cultural resource planning and management, human behavior and perceptions and environmental design. These decisions are inherently fraught with high uncertainties due to their qualitative nature, and the lack of empirical and theoretical research on which to base these decisions. Koh (1980) summarized the importance of this research.

> " as long as environmentaal designers maintain reductionistic thinking, they will remain incapable of explaining why and how an environmental structure takes the form it takes, and why and how people perceive things and behave the way they do in a specific environment. Consequently, their design will appear either unintelligible or arbitrary to other disciplines and user groups. "

As is often the case when one is proffering new concepts to a practising profession, there is a need to define terms and assumptions underlying these concepts. "Landscape planning and design"is concerned at the theoretical level with three major components: nature, humanity aesthetics. "Nature " includes studies such as ecology, botany, and soils;"humanity" deals with social, political and economic factors, including behavioral/perceptual qualities; "aesthetics" involves such qualities as composition, form, color, and scale (Zube,1980). Landscape planning and design is a subfield within the landscape architecture discipline concerned with activities such as regional planning, land assessment and evaluation and large scale analysis and design (Fabos,1979; McHarg,1969 ; Zube et al,1975).

The terms"futures-oriented or"futures-approach" are actions based on the results of futures research. A primary objective of futures research is to increase our understanding and awareness of future developments and impacts so that proper steps are taken to allocate our resources accordingly,and/or mitigate these effects. Futures research commonly projects several plausible alternative futures, and based on analysis, selects a range of "most likely" alternatives. The techniques used to project and analyze alternative futures include brainstorming, Delphi, extrapolation of trends, scenario development, cost/ benefit analysis, technology assessment, and decision matrices (Ayre,1969; Dalkey,1972; Harmon, 1976; Rooney,1971). Related to the time aspect of futures research is the descriptor, "long term." Long term may describe any activity covering a relatively long period of time. For the purposes of this thesis, long term begins in the present and extends for a long period of time into the future; this period of time is defined as 25 to 50 years.

Another term is the notion of " continuous learning." A simple definition of this concept is the perpetual process of acquiring knowledge. A person can be involved in continuous learning either passively, as through personal experiences, or actively, through rigorous pursuits of education and knowledge. The notion of continuous learning has been discussed by others; Theobald (1967) describes it as "learning to learn." He feels that individuals need to "know how to adapt and how to achieve new competencies "within a changing society; Michael (1973) explains this notion as the need for "social/institutional learning"to occur within all levels of society, including government, corporate and public sectors. Two methods he describes to achieve this end are to develop feedback mechanisms within social structures, and for "error-embracing" to occur, e.g. for society to recognize and learn from its previous mistakes. Higher education institutions apply a continuous learning approach in the form of " Continuous Education Programs," which offer courses of special interest to the community. This thesis presents how continuous learning can be supported by new technology in information communication systems.

This thesis is not based on empirical research, but is derived from observation, literature analysis and professional judgment and intuition. The overall goal is to increase the state of the knowledge of the landscape profession through the application of new technology and research results which can support the positive evolution of the profession. This goal is based on the notion that a primary purpose of research institutions,i.e, universities, is to explore new avenues which can address the <u>future</u> needs of the profession. Reseach of this type is often criticized as "academic" by practitioners or pragmatists within the field, but without investigation into new areas, without the creation of new knowledge, a profession can lose its innovativeness and ability to respond to change. Theoretical research is needed to maintain a profession's integrity and ability to expand its boundaries as necessary.

To achieve the purpose of defining a landscape planning and design decision process, the thesis is organized in the following manner. Chapter two reviews the literature concerning uncertainty in decisionmaking. The understanding of uncertainty resulting from this review provides the causes, approaches and responses to uncertainty. These responses are the bases for the following two chapters; chapter three presents the development of a futures-responsive long term resource monitoring program; and chapter four describes the continuous learning potential of computer-based information exchange networks. The final chapter summarizes the results of this research and presents future developments and research concerning a decision process.

CHAPTER 2

UNCERTAINTY IN DECISIONS

This is an overview of uncertainty as it is discussed in the literature. This review will determine the underlying causes for uncertainty, develop approaches to deal with uncertainty, and formulate responses to uncertainty which can be applied to the decisions landscape planners and designers are confronted with.

To aid in achieving an understanding of decisionmaking under uncertainty, McKenna, (1980) describes the various states of decisionmaking aa a continuum from decisonmaking under ignorance (no knowledge) to decisionmaking under certainty (complete knowledge). Within these two extremes, he describes two other states.

> "Decisionmaking under risk; more than one state of nature (or uncontrollable factor) is known to exist and the probability of each state is known;"

> "Decisionmaking under uncertainty; more than one state of nature is known to exist, but the probability of any state is unknown."

Webster defines uncertainty simply as " the state of being uncertain; unpredictability, indeterminancy, or indefiniteness."

A large part of the literature addresses uncertainty by looking at possible outcomes or alternatives and assigning them a probability of occurrence. This type of approach to uncertainty is related to various disciplines such as systems engineering economics or business administration (Schlaifer, 1969; Dyckman,1972; Kaplan,1979; Borch and Mossan,1968;Halter and Dean, 1971; Davis, 1971). The focus of the following literature review rests on the belief that there is more to uncertainty than simply assigning probabilistic values to potential outcomes. This is supported by a number of authors from various disciplines such as social psychology, planning, ecology and future studies.

Selected Literature on Uncertainty.

This literature is selected on the basis of providing significant insight into the uncertainty in landscape planning and design decisions.

Schon (1971) in his book Loss of the Stable State, views uncertainty in terms of the relationship between uncertainty and stability, i.e. the stable state. He feels that;

> "belief in the stable state is central because it is a bulwark against the threat of uncertainty, In all domains of ones experiences, transforming technological, theoretical, or social systems means passing through zones of uncertainty. This does not mean risk or the probability of some future event occurring, but the situation of being at sea, of being lost, of confronting more information than one can handle. The situations of crisis are the ones that provoke uncertainty. The most threatening changes are the ones that would plunge the system into uncertainty. There is not an information gap. There is an information overload, too many signals, more than can be accounted for; and there is as yet no theory in terms of which new information can be sought or new experiments undertaken. Uncertainty is a way of talking about the situation in which no plausible theory has emerged. Uncertainty is the transition from one stable state through a period of turbulence, into another and different state, from which pragmatism and other actions may again become an appropiate response."

Schon's solution to getting through these periods of uncertainty between stable states lies in the importance for the person, for our institution and for society as a whole, to "learn about learning." We must, in other words become adept at learning; we must not only be able to " transform " our institutions in response to changing situations and requirements, we must invent and develop institutions which are "learning systems." i.e. systems capable of bringing about their own continuing "transformation."

Dalkey(1972) approaches uncertainty in the sense that there are some issues which no matter how extensive the information is regarding them, this information is still insufficient to select an appropiate decision with high confidence. These issues are usually those dealing with environmental or social concerns, i.e. quality of life. Surrounding the decisions dealing with these issues is a "cloud of uncertainty,"attended by "mysterious intangibles," which make it very difficult to arrive at a firm decision. His solution for resolving uncertainties of this type is through a group decision process of informed experts on the issues based on techniques of systematic group judgment. This process is known as " Delphi."

Another study of uncertainty is found in "Sources of Uncertainty in Ecological Models" (O'Neil and Gardener 1978). The study grouped these sources under three headings; model structure, parameter error, and natural variability in ecological systems. Of these three, the most significant is the variability of ecological systems defined as a cause of lack of predictability of the environment which leads to uncertainty in the model predictions. They conclude that," in general, environmental variability can be expected to be a significant contributor to uncertainty whenever model objectives require predictions of future behavior of the system." The authors do not present a method for approaching this uncertainty but the study is important in that it recognises uncertainty as a result of future actions of the variable being modelled.

An important assessment of uncertainty is presented by Fildes et al(1978) dealing with the contrasting notion of real versus perceived uncertainty. They feel it is more realistic to define uncertainty in terms of deviation from previous patterns. The questions to be answered then, are whether deviations from expected trends are actually worse than previously determined, or whether we just think they are; and what help, if any, can forecasting provide to reduce real as well as perceived uncertainty. The authors summarize that uncertainty itself has not become worse but that perceived uncertainty has risen, and that current response should be directed towards actual rather than perceived uncertainty. One response they advocate towards reducing actual uncertainty is the adoption of formal forecasting systems.

Boroush et al (1980) discuss three fundamental positions which may be taken in the face of intrinsic uncertainties. One approach is to conjecture plausible environmental developements and ask "what if" questions, such as, what social consequences will result if these developments should come true ? The underlying concept is that of contingency planning. The individual taking this approach may be unsatisfied because it is unclear how many contingencies should be considered, and there is no comparison of the likelihood between contingencies. A second approach, in contrast to the "What if" question, is to try to explicate the degree of uncertainty through subjective judgments. The difficulty with this approach is; whose judgments should be used, how credible they are, and whether all the critical uncertainties have been identified. A third approach is to acknowledge that, uncertainties in decisionmaking are so high that we really do not know what contingencies to plan for, and we do not know all the potential effects of our decisions, let alone assigning subjective probabilites of the occurrence of each effect by a certain time in the future. By acknowledging openly that we do not know enough the authors feel we can remove one of the psychological barriers to "social learning."This approach to uncertainties emphasizes social learning in the planning/design process, instead of dealing with uncertainties by special methods in the methodology. This acknowledgment of uncertainty reduces the chances for undertaking planning/design in the mistaken belief that one knows what one needs to know. The authors conclude that in order to deal with uncertainties effectively, we need long term assessment programs which consist of interrelated projects continuing over time.

Approaches to Uncertainty

The literature reviewed exemplifies that the phenomenon of uncertainty is more complex than simply assigning probabilities to potential outcomes. Four causes of uncertainty were identifed. It may be: (1) the result of unstable environmental/social conditions; (2)perceived or real; (3) created from an information overload; or (4) resulting from lack of information. Based on these causes, three approaches to uncertainty were discussed:

a) adoption of a futures approach in decisionmaking

b) incorporate continuous learning and feedback mechanisms into the decision process.

c) acknowledge and recognize that uncertainties exist.

These approaches are discussed in the following paragraphs.

The adoption of a futures approach must be recognized as critical for landscape planning and design. By actively pursuing the future of a situation or condition, ones awareness can be increased, and preparations initiated, to resolve problems/ conflicts before they become a crisis. A futures approach also allows the planner/ designer to be more aware of and responsive to change and increases their ability for the planning and design of creative social futures.

The incorporation of learning systems, i.e. continuous learning and feedback mechanisms, into the decision process is the key to formulating a process responsive to the needs of practitioners while also maintaining a high degree of integrity and knowledge within the profession. Communication is the means for allowing learning and feedback to occur, therefore a decision process must embrace an approach allowing for group processes, interactions and sharing of information and ideas to occur.

Acknowledging and recognizing that uncertainties exist and pervade the decisions faced by landscape planners/ designers is the most radical and most necessary approach that should be embraced by the profession. Failure to acknowledge that uncertainties exist leads one towards avoiding situations high in uncertainty, meaning that one acts as if they really know what is involved in a problem or decision. (Michael 1973). Avoiding uncertainty requires not recognising the need for continuous learning approach within the profession.

Responses to Uncertainty

From these three approaches to uncertainty, two responses are presented, emphasizing the importance these responses have towards developing an effective decision process for landscape planning and design. One response to uncertainty is exemplified in a research project on long term resource monitoring. This project is selected as a response because it (1) presents the need for long term measurements and data; (2) identifies future issues related to landscape planning and design, and (3) determines the information we should be collecting now to respond to these future issues.

The second response to uncertainty is the development of an interactive computer-based information exchange network. The network is composed of regionally distributed microcomputers corrected via standard telephone links. The major activities of human communication on computer are electronic messaging and computer conferencing. The exchange of information on computers supports the process of continuous learning and feedback, increases interaction between professionals and integrates existing information resources. These two responses to uncertainty are examined and further discussed in the following two chapters.

CHAPTER 3

LONG TERM RESOURCE MONITORING;[1]

A FUTURES APPROACH

One approach to uncertainty in planning and design decisions is the adoption of futures forecasting techniques. Long term resource monitoring is a response to uncertainty that takes this approach. Long term monitoring also serves to reduce uncertainty by increasing our knowledge base concerning the interactions of nature, humanity, and aesthetics, thus assisting in the development of a theoretical basis for the profession. This chapter is organized in four sections; the first section provides an overview of previous monitoring activities; the second identifies the problems and addresses the needs for monitoring; the third presents the procedure for determining relevant information; and the fourth section discusses information communication and transfer.

1.The work described in this chapter partially represents the combined contributions of several investigators on a three year research project "Long Term Resource Monitoring: Developing Procedures." Personnel associated with the project are: Michael M. McCarthy, Principal Investigator;Hanna J. Cortner, Jimmy LaBaume, William Matter, and Donovan Wilkin, co-investigators; and Kevin Noon, fellow research assistant. Individual monographs and publications as a result of their efforts are cited accordingly in the text.

Overview of Monitoring

This section is a general overview of the definitions, purposes and functions of monitoring. These foundations are presented so that one may gain an understanding of current work accomplished in this activity. It should be evident from the examples presented that monitoring is implemented for a wide variety of reasons and functions and encompasses multiple disciplines. An annotated bibliography of the monitoring literature can be found in Appendix A.

Definitions of Monitoring

The following selected definitions indicate the diverse approach taken by investigators towards monitoring. The Council of Environmental Quality(1973) broadly defines monitoring as" the systematic and continuing observations of environmental parameters that are collected nationally. Environmental parameters include not only the physical environment but also factors as population, economic development, natural resources, recreation, and aesthetics." A simple and universal definition is stated by Johnson (1978) as" the process of repetitive observation of one or more elements or indicators of the environment according to prearranged schedules in space and time." Waller(1976) used monitoring more specifically in an evaluation function and defined it as " the collection, management,and use of specific information on events associated with the operation of a project or group of projects."

Purposes for Monitoring

These purposes exemplify various monitoring programs. The traditional purpose for monitoring is to establish baselines, detect trends, enforce regulations, provide forecasts or warnings, and/ or define possible hazards (Gardener,1972). Roberts (1978), express monitoring in a planning context as having several purposes, among these being: (1) to determine whether actions are achieving agreed upon goals and objectives; (2) to determine whether one is using the most efficient means for achieving goals; (3) to determine if the method of planning is valid; (4) to provide a basis for decisions to determine if one should revise the strategies for obtaining the goals and objectives, or if the goals and objectives themselves should be changed; and(5) to identify important unintended consequences of our actions.

Functions of Monitoring

Three functions of monitoring are evaluative functions, baseline measurements and long term monitoring. These functions illustrate the different roles that monitoring may assume, although they are not mutually exclusive. A particular program may incorporate a combination of these functions during the course of its application.

Evaluation. This is often associated with monitoring, particularly with landplanning applications, as presented in articles by Roberts (1978) and Floyd(1978). Waller et al (1976) on the other hand discuss three characteristics of monitoring that distinguish it from more intensive evaluation. These distinctions are; "(a) if objectives are in terms of changes expected to occur beyond the immediate activity, then monitoring should focus on events that constitute the change, and not be restricted to activities designed to achieve the change: (b) comparison with what actually happens with what had been planned or expected, that is, monitoring is to document the events that actually do occur, not why they occur and (c) the most important distinction is the timeliness of the information - the purpose of monitoring is to detect the fact that results are not occurring while there is still time to take remedial action."

Baseline Measurements. Baseline measurements are presented by States (1978) as "any investigation conducted prior to the breaking of ground in order to provide a basis for decisions." Bormann and Likens, (1978) introduce the idea of a baseline as a point in time and space from which future measurements may be made and resources monitored. The results of an ecological baseline study describe the existing ecological conditions and trends in the potentially affected region, providing a reference baseline from which environmental scientists can:(1) predict the effects of the proposed action and recommend alternatives; (2) define appropiate mitigation measures; and, (3) design future programs to monitor the accuracy of predictions and their effectiveness. (States, 1978).

Long Term. Long term monitoring has previously had limited research directed towards it. To aid in understanding what constitutes "long term" it may be helpful to distinguish between "short term" and "long term." Maki (1980) described biological short term studies as those involved with predictive toxicology of mammals and aquatic life, environmental spill impacts, and general acute-impact studies. Long term biological applications consider subtle aquatic and terrestial community shifts, continuous monitoring of point and nonpoint effluent discharges and methods for monitoring the long term impact of industrial and energy related facilities. The value of long-term studies have recently been recognised by organizations as the Institute of Ecology, the National Science Foundation, and the Council on Environmental Quality.

Problem Identification

The first step towards creating a futures-responsive monitoring program for planning and design is to identify the problems and address the needs for monitoring. The monitoring overview shows that traditionally monitoring has occurred without a specifically defined purpose, and the information collected in the past has not been effective in addressing the problems occurring in the present. One reason for this is because there is little agreement among professionals and decision-makers as to what should be monitored, and procedures for monitoring. This lack of agreed upon purpose and procedures is particularly evident with respect to long term monitoring. Since "long term" implies an extended period of time, this greater time function increases the uncertainty surrounding the decisions for monitoring, thus decreasing the probability of collecting information relevant for future decisions.

The purpose of the overview on monitoring was to illustrate the strengths and complexities, as well as the weaknesses and deficiencies which exist in environmental monitoring. With regard to the strengths and complexities, it is evident that monitoring requires an inter-disciplinary approach, and that monitoring should be integrated among resources and disciplines, which will reduce duplication of effort, and enhance interpretation and usefulness of the data collected. Another factor which tends to increase complexity is that monitoring inherently requires that data be collected over time. This time function is often not given adequate consideration when developing a monitoring scheme, thus reducing the effectiveness of the information collected, since the problem which initiated the program may have changed, or the information collected is no longer useful. There are two major deficiencies evident in present monitoring applications. One is that existing programs do not address future problems; if we are to be able to plan and make effective decisions, we need to determine the information we will want to know in the future. This is related to the requirement of time in order to collect the data in monitoring. The other deficiency is the lack of procedures for monitoring. There are no known procedures or guidelines for resource monitoring available in the literature.

Monitoring in its simplest sense means repeated measurement. These measurements, taken at certain time intervals, provide time series data which can be used to show change and determine trends; unfortunately much of what and how we monitor is accomplished in this simple manner. In order for monitoring to be most effective, it needs to be more complex than merely repeated measurements. Monitoring should have a specifically defined purpose and objectives, and more importantly, be collecting information which will be relevant over time. That is, an inherent problem with monitoring is the function of time. We should'nt begin collecting the information we need to have now, but rather, we need to determine what it is we will want to know in the future, so that we may begin monitoring for that information now and apply it at that future time. It is the very phenomena of "time" that forces us to recognize monitoring as a planning/design function. Any study or examination of an area can produce new information or a better understanding of that area; what is needed, however, is a purposeful monitoring program that will allow for better planning and design decisions in the future.

Need for Monitoring

Our nation is increasingly concerned with the development of its lands. Conflicts among agricultural uses, mineral development, environmental quality concerns, fish and wildlife habitat requirements, and various recreational activities are increasing. The complexity of the impacts of an expanding population on the earth's fragile and often finite resources has been identified. (Pirages and Ehrlich, 1974; Brown, 1978).Consequently, there is a continuing need for comprehensive methodologies and programs which will allow for the identification and evaluation of the effects of proposed resource policies or decisions before they are established.(McCarthy et al, 1981).

Long term resource monitoring is based on five premises;(1) there is a need for long term monitoring of natural and cultural resources; (2) to be most effective such monitoring should be integrated among resources and disciplines; (3) there are few, if any, guidelines which outline how such monitoring can be accomplished; (4) monitoring should be influenced by social values and objectives; and (5) long term monitoring needs to identify future problems and conflicts, and collect the information needed to address these conflicts.

There have been relatively few long-term interdisciplinary monitoring efforts. In these few efforts" long-term" is usually defined as 3 to 5 years. A National Science Foundation report (NSF,1978) points out:

> "It is no easy task to design a long-term program. Looking back, one may see many poor examples of data collected for their own sake, of programs continued merely because they have been there for a long time, and of data almost worthwhile but left incomplete and lacking the crucial piece of information to make the whole set meaningful. A central issue or a hypothesis to test or to guide the collection of data seems to have been missing."

Although monitoring may go on in the absence of well-defined goals and objectives, Marcus(1979) points out that the value of a monitoring system is measured by the extent to which it shapes future decisions. Long term monitoring should be viewed as an integral part of landscape planning and design which is in turn, a primary and continuing resource management activity. Goals and objectives of resource management are ultimately dictated by resource "values." Therefore monitoring activities will be influenced by the value-oriented goals and objectives of society. R.L. Andrews et al in Environmental Values in Public Decisions,(1978) states that:

> "values must be inferred from empirical indicators, and that these change over time. It follows that time-series data are important and often essential if values are to be understood and properly considered in most decisions. At present, however, such data do not exist for many, if not most of the indicators we might wish to use. Some of those that do exist have been collected in forms that are difficult or impossible to combine. Most inferences about values, therefore, or even about empirical consequences of actions, are based upon project-specific analyses that use static inventories or at best short-term studies. Since project planning times are often shorter than generalizable time series, project-specific studies have little or no predictive utility, and in their present form rarely provide

any cumulative approach to understanding.

This approach assumes that resources have values (economic, aesthetic, recreational,nutritional, etc.) to people consistent with certain societal goals. Our political structure reflects these societal goals, which in turn give rise to resource values, although it is often an imperfect reflection. Monitoring should not be restricted to traditional environmental and ecological measures. Monitoring of societal concerns, political and legislative actions, and resource management activities should be an integral part of any long-term resource monitoring program and be influential in determining the information collected (Matter et al,1980).

Determining Relevant Information

Having identified the problems with previous monitoring programs, as well as the needs for monitoring, the next aspect is determining the information collected. How does one determine what needs to be monitored and what information to collect for landscape planning and design purposes? One technique would be to examine speculatively the best projections of what the world of twenty-five to fifty years from now would be like, and ask the question,"What is the information we would like to know at that time that we could begin collecting now ?" This approach is not based on normal scientific method or past case studies. It argues that many existing monitoring programs are conducted in a myopic fashion and that a broader, nonreductionist view towards monitoring is needed. This approach begins with the premise that the purpose of monitoring is to make better landscape planning and design decisions at some time in the future. A difficulty with the concept of this monitoring is that because it is a collection of parts, it too tends to be reductionist by nature. (McCarthy et al, 1981).

In a recent issue of "Resources," the newsletter of Resources for the Future (Spring,1981), a strategy for understanding resource problems is outlined that supports the premises presented.

> " There is a propensity in the American character to see problems in terms of crises. The energy crisis, the urban crisis, and others have paraded across the national stage and dominated public interest only to fade from consciousness when relative calm returns.
>
> Fanned to flame by the newsmedia and other interests, public attention quickly burns out without fresh fuel. Interest cannot be sustained at fever pitch, and new crises overwhelm old ones. Novelty seems the equal of substance. Long-running problems, risk inducing collective boredom.
>
> The crisis syndrome performs a profound disservice to the nation. In the fields of natural resources and the environment for example, the problems mostly are long-term and require sustained effort even to understand what is involved, let alone to forge solutions. A rollercoaster of public interest (and government and foundation research) does not provide a context congenial to the kind of longrange research, analysis and social institution building required. Crises occur, to be sure, but they usually represent a trend or deep-seated problem, and the prominence of the one must not obscure the greater importance of the other."

To realistically consider the monitoring program being advocated, it is necessary to develop procedures for examining emerging trends for the near future. There are a number of ways to do this.

One recent study indicative of futures research was done by John Naisbett(1980). He approached the question by assuming that trends are better identified by local behavior rather than by reports of a selected few. Accordingly, he monitored social changes from over 200 newspapers within the U.S. The 10 most important emerging trends he identified are:

Number	From	To
1	Industrial Society	Information Society
2	Centralization	Decentralization
3	Party Politics	Issue Politics
4	Machines	Human Technology
5	Racism/Sexism	Ageism (equality)
6	Top-down management	Bottom-up Management
7	Equal Education/health	Equal Access to Capital
8	Bigness	Appropiate Scale
9	Company Board of Directors	Independent Board of Directors
10	Representative Democracy	Participatory Democracy

The approach utilized in this study, different from Naisbett's but supported by his findings, is the examination of technical and lay literature on the future, Over 30 "futures" documents were reviewed, ranging from The Global 2000 Report, to Alvin Toffler's The Third Wave. Through examination of these sources, certain patterns of projections emerged. These patterns represented a broad range of published views on projected views in areas as land-use, population natural resources, energy, and new technology. Using the criteria that each projected change be supported in at least five sources, a list of projections was created.[2] These included concerns such as:

1. International tourism will play an integral part of the economic development of countries.

2. An extinction rate of species, previously unimagined will efface the world probably at a rate of 50 species per day over the last quarter of the century

3. By the second decade of the 21st. century the majority of the population of the U.S. will be classified as elderly.

4. For every two people on earth in 1975 there will be three in 2000 A.D.

2. Kevin Noon and Michael McCarthy participated in the compilation of these projections.

5. By the year 2000, 40% of the presently remaining forests in the underdeveloped countries will be chopped down and is representative of a continuing lack of understanding of ecological integrity.

6. Migration patterns of people in the United States will continue from north to south (the sunbelt).

7 The move from an industrial era to an information and communication period - the computer/telecommunication/ media environment will result in significantly changing knowledge patterns and professional opportunities.

8. The possibility of a third world war will remain ever-present and will continue.

9. Living standards have risen greatly during the 20th. century but wealth remains unequally distributed and will continue so.

10. The largest minority in the United States will be Mexican-American. By the year 2000 Mexico City will be the largest city in the world with a population of over 20,000,000 people.

11. In the 1980 census there was revealed a move from urban areas to rural. Rural communities and states are now growing faster than urban ones and will continue to do so.

12. Nations have been extending their claims to ocean areas off their shores. If the current trend continues, the coastal nations will eventually have the oceans divided up among themselves. Who assumes this responsibility ? The plannings of the oceans will result in a major restructuring of national affairs.

13. As population rises, conflicts over energy and water supplies will be greater and conflicts of use will increase over time.

14. Despite rising expenditures for education, increasing numbers of young people lack the basic skills to function effectively in modern society. The educational system must be improved and be more relevant to the changing conditions.

15 In the future telecommunications and teleconferencing will be "real" and face-to-face modes will seem inadequate.

16 Productive agriculture land will continue to be converted to other non-food producing uses.

The complete list of projections was reviewed by the noted futurist Robert Theobald for further verification. As author of a recent study for the U.S. Department of Agriculture on Future Challenges to Renewable Natural Resources, and as a resident of Arizona, Theobald brought a particular viewpoint important to the research effort. No substantial changes were identified as a result of his review.

Using the list of projections formulated, a modified Delphi approach was used to determine appropiate monitoring topics. The Delphi Method (Dalkey et al,1972) is based on the concept of iterative decision making through the use of "informed experts." Individuals recognized for their contribution in a number of natural and cultural resource disciplines were asked to rank order the projections based on their assessment of the impact the projected change would have on the planning, design and management of the land.[3] At the same time the list of projections was also presented to over 150 planners and designers attending a conference in the area. They were also asked to rank order the projections based on the impact to land, planning design and management. From these two independent surveys there emerged an agreement on the top five projections. (It is interesting to note that while there existed some differences as the ranking progressed, the mean ranking for the top five projections was the same between the groups.) These five included (listed in no order):

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3. "resource experts" included individuals whose disciplines were: foresters, land planners, landscape architects, range managers, recreation scientists, political scientists, geographers,sociologists, agriculturists, plant pathologists, environmental psychologists, university administrators soil scientists, plant scientists, system ecologists, wildlife ecologists, and agricultural businessmen.

In the 1980 census there was revealed a move from urban areas to rural. Rural communities and states are now growing faster than urban ones and will continue to do so.

For every two people on the earth in 1975, there will be three in 2000 A.D.

The move from an industrial era to an information and communication period - the computer/telecommunication media environment will result in significantly changing knowledge patterns and professional opportunities.

As population rises, conflicts over energy and water supplies will be greater, and conflicts of use will increase over time.

Productive agricultural land will continue to be converted to other non-food producing uses.

Identifying Monitoring Measures

After identifying the five future projections, the modified Delphi approach was continued with the resource experts to determine specific monitoring measurements required to address these projections. The process determining these measurements required four iterations and went as follows:

Round One. The resource experts were presented with the top five general projections as determined by the futures survey. The experts were asked to list below each of these projections three SPECIFIC MEASUREMENTS they would use if they were to monitor for long term changes in Arizona. In other words, what would they like to know in the year 2001, and wish they had measured in 1981.

Round Two The measurements provided by the resource experts were collated by topic area and presented in a second round to them. They were asked to pick the top three measurements from the total list provided under each projection.

Round Three. From the votes for these measurements, the top five measurements were determined, and were presented to the resource experts in a third round. From this list of five, the experts were asked to check the three statements under each projection that would provide information for a monitoring program within Arizona based on a long-term approach.

Round Four. The monitoring measurements under each projection were again ranked according to the voting percentile scores. The top three measurements were presented to the resource experts, who were asked to check the one measurement that would provide the information for a long-term monitoring program in Arizona. These votes were collated and top measurement for each projection was determined.

The results of the Delphi process produced five monitoring measurements: (McCarthy et al, 1981).

Monitor the amount and rate of rural lands being converted to other uses in terms of perceived and measurable impacts.

Monitor the impacts to unique natural or built areas due to increased use of such areas and the displacement effects on both the physical and experimental carrying capacities.

Monitor the impact of the rapid rate of adoption of new technologies on land use patterns.

Monitor areas in conflict due to the consumption of water and energy by competing uses, i.e. agriculture, urban, industrial and others as they related to perceived and real costs.

Monitor the conversion rate and amount of retirement of productive agriculture lands to other uses and determine the reasons, both perceived and real, for this conversion.

From the five general monitoring measurements developed from the future projections, the project investigators found it necessary to further define these measurements to reflect the characteristics of the semi-arid southwest region of study. Each refined measure is described as the "regionally appropiate monitoring measure" (McCarthy et al, 1980), and is presented with its corresponding future projection and monitoring measure in the following section.

Identifying Monitoring Sites

The organization of this section is to present sequentially the: Future Projection ; Monitoring Measure ; Regionally Appropiate Monitoring Measure; and, Basis of Site Selection. The "basis of site selection" provides the rationale, and describes the technique, for selecting and identifying monitoring sites.

Future Projection 1. In the recent census there was revealed a move from rural areas to rural. Rural communities and states are now growing faster than urban ones and will continue to do so.

Monitoring Measure. Monitor the amount and rate of rural lands converted to other uses, in terms of perceived and actual impacts.

Regionally Appropiate Monitoring Measure. In the semi-arid region of this study rural lands are considered to be primarily rangelands. Rangelands are those areas that are neither built upon nor cultivated; more than 87% of Arizona's land area is considered rangeland. Of this percentage, less than 9% is in private ownership, containing approximately 15% of the state population.

The conversion of rural lands has led to one of the most pronounced changes to occur in the landscape, as since 1950 there has been an explosive increase in rural subdivisions. Rural development has changed the landscape more radically during the past 25 years than have the more traditional activities of agriculture, mining and forestry. Over three-quarters of all rural subdivisions are in areas considered as rangelands. It follows therefore, that the primary single conversion of rural lands has been to subdivision development. Other rural land changes which may occur, though to a lesser degree, may be for energy development, such as large scale solar or wind installations, biomass production, or dry farming of new crops such as jojoba or guayule.

The important aspects of this regionally appropiate measure include the sequential measuring of both the actual impacts and effects of this conversion, as well as those perceived by the public. For example, is the quality of life diminished by removal of rural lands and rural land belts around urban areas: to what extent do we know the real rate and amount of such removal? The anticipated methods for determining rural land changes are through survey research on the perceived changes by various population sectors, in conjunction with remote sensing and video rechniques for the actual measure of rate and quality. (McCarthy et al, 1981).

<u>Basis of Site Selection</u>. The rural land monitoring sites are determined from: personal interviews with arid land specialists and range managers; mapping overlays of land ownership and land use maps; and field

reconnaisance. The sites identified for monitoring are selected from the private ownership lands within the region of study, since most increases in settlement, and changes in rural landscapes which occur, will be on private land (Hecht and Reeves, 1981). An important future development which may occur in these rural lands concerns land-ownership exchanges between various public agencies and private owners(Gregg,1981). It is therefore necessary that the sites chosen for monitoring remain flexible and be able to provide information responsive to the development of future land-swaps.

Future Projection II. For every two people on earth in 1975 there will be three in the year 2000.

Monitoring Measure. Monitor the impacts to unique natural or built areas due to increased use of such areas, and determine the displacement effects on both the physical and experimental carrying capacities.

Regionally Appropiate Monitoring Measure. Within the regional context of this study, unique natural areas are considered to be wilderness/ primitive areas representing various levels of designation and recognition. Unique built areas are urban areas of cultural significance or areas recognised for excellence in design. This measure monitors the change in users which occur over time within these significant natural or urban areas. Displacement effects are the series of changes in users over time as different users seek different experiential outcomes from the natural or built environment. Designers and planners need to know the impact of their decisions on use patterns of these resources.

Basis of Site Selection. In order to determine the displacement effects occurring within natural and built environments, sites chosen for this measure are based on a "matched pair" criterion. For example sites for wilderness/ primitive areas are chosen based on a matched pair of small watersheds representing different levels of designation and use; i.e. one site is chosen in a well-known and highly used primitive/ wilderness area, with the matched site in a wilderness/primitive area providing a different experience, and receiving less use. Sites for unique built environments are chosen on the same matched pair criterion with a different site representing a different level of use and perceived experiential outcome.

Future Projection III. The move from an industrial era to an information and communication period - the computer/telecommunication/ media environment will result in significantly changing knowledge patterns and professional opportunities.

Monitoring Measure. Monitor the impact of the rapid rate of adoption of new technologies on land use patterns.

Regionally Appropiate Monitoring Measures. It is postulated that one of the largest impacts to the use of the land and resultant pattern of use will begin in this century due to the move to the information age. As places of residence increasingly become a home and office, work location due to the use of telecommunication/computer networks, residential development patterns will change, i.e. the development of the "electronic cottage" industry (Toffler, 1980). One of the advantages of the marriage of the telephone and microcomputer is the flexible work hours and location it can provide. For this reason, individuals will have the opportunity to work from their homes on interactive computer terminals. The impact of this terminology is that professionals and administrators will not need to live within urban areas in close proximity to their offices, but rather relocate in areas offering increased amenities such as clean air, open space and senic beauty. To determine the extent of this impact on land use requires the study of areas where this relocation can be controlled and measured. This measurement attempts to monitor the effect of such technological innovations by determining new and changing land use development. For example, in our region, one can measure the development of "encapsulated communities," i.e. the changes which occur within small remote communities which are isolated due to their location adjacent to public lands.

Future Projection IV. As population rises, conflicts over energy and water supplies will be greater and conflicts of use will increase over time.

Monitoring Measure. Monitor areas in conflict due to incompatible uses on the resources base, and the consumption of water and energy, i.e. agriculture, urban, recreation and others, as they relate to perceived and real costs.

Regionally Appropiate Monitoring Measure. Every region contains areas that are significant due to their status as "conflict areas," where competing uses for the same resource produce problems of allocation to the best of optimum use.

where competing uses for the same resource produce problems of allocation to the best or optimum use. This measurement proposes to monitor such conflict areas over time to develop an understanding of both fiscal and social costs as different use strategies evolve.

Basis of Site Selection. Conflict areas representing high competing uses were determined through survey research to various land-managing agencies. The agencies responded to the survey by listing areas within their jurisdiction where conflicts for a resource are occurring, and defining the cause of conflict present. Based on these results, a cross-impact matrix of causes of land use conflicts was determined, and one or more sites are chosen for each type of conflict present.

Future Projection V. Productive agricultural land will continue to be converted to other non-food producing uses.

Monitoring Measure. Monitor the conversion rate and amount of retirement of productive agricultural lands to other uses, and determine the principal reasons, both perceived and actual, for this conversion.

Regionally Appropiate Monitoring Measure. In monitoring the conversion/retirement of productive agriculture lands, this measurement contrasts the perceived versus the actual reasons for this occurrence. In our region, an appropiate measure of the actual reason may be high salinity from irrigation practices, which reduces soil productivity and causes the owner to put the land to another use. This conversion may be perceived as urban development, or attributed to some other cause.

Basis of Site Selection. The sites for monitoring the conversion/ retirement of agriculture lands were determined initially from interviews with various government and university orgainzations. Based on these interviews, a continuum included causes such as high salinity in irrigation water, rising water table, land subsidence, water rights procurement, lowering water table and urban encroachment. The final monitoring sites will be selected as representative areas corresponding to each of these causes.

It is interesting to note that from these interviews, the loss of agriculture lands into urban development is not presently a major conversion factor. But with the recent passage of the Arizona Water Law, which requires developers to guarantee a 100-year water supply before they build, there will be inevitably an increase in the amount of agriculture land converted. Urban areas such as Yuma, Phoenix, Wilcox and Tucson can expect increasing conversion of these lands to urban development.

A futures-oriented, cultural and natural resource monitoring program providing information collected over time is a necessary input into a planning and design process. Equally important to this process is the communication of this information between planners and designers, in order that results be compared and a common knowledge base established.

Communication and Sharing of Information

The third step towards creating a futures-responsive monitoring program for landscape planning and design is for the communication and sharing of information among planners/designers. There are several existing methods for communicating information within the landscape profession. These include sources such as publishing in journals, presentations at conferences, in-house monograph documents, face-to-face meetings, and the phone or postal system. A common deficiency with these methods is their "one-way" nature, and the presentation of more information than needed. Another means for communicating and retrieving information has recently been developed. This is the result of new technology based on the marriage of the computer and telephone, i.e. telecommunications, into computer-based information networks. This technology, and its advantages and implications, are described in the following chapter.

CHAPTER 4

CONTINUOUS LEARNING:

COMPUTER-BASED INFORMATION EXCHANGE NETWORKS

As concluded in Chapter Two, a response to uncertainty in landscape planning and design decisions is the development of an interactive computer-based information exchange network within the profession. An information network can support continuous learning and feedback, and allow for group processes and interactions, by increasing the communication and information exchange abilities among planning/design professionals.

As evidenced in the last decade, a single isolated computer can store and process a great deal of data, and allow users to retrieve information upon request. For purposes of landscape planning and design, the computer can aid the planning process in many ways. For example, in the area of landscape assessment, computers can be used effectively for searching from a database co-occurences of special or critical landscape resources, natural and man-caused hazards, development suitabilities based on natural and cultural characteristics; and the ecological compatibilities of various land uses. (Fabos,1981). A microcomputer also offers assistance in many office procedures, such as estimating project costs and specifications, payroll and accounting, file storage, and word processing. But this is not utilizing the potential technology available to landscape planners and designers. By creating an environment in which computers communicate to other computers, via telecommunications, increases the relevant information available for decision making and problem solving. A computer-based information exchange network could consist of several regionally distributed microcomputers, each containing their own regional information base. The information exchange network, through electronic messaging and computer conferencing, could integrate available information resources, develop cooperative research efforts, and provide for increased interaction between professionals.

An information exchange network can allow the profession to adopt new approaches to problem solving, and provide conditions for continuing learning, if the profession recognises three necessary concepts: (1) the emergence of an infomation and communication period, which requires the adoption of new and innovative approaches to decision making and problem solving;(2) the need for cooperation, not competition, i.e. increased information sharing; and(3) the creation of an environment for "learning to learn." We need to be aware that receiving the stamp of approval on university degrees and registration papers does not mean we accept the mistaken belief that one knows what one needs to know. Through the process of continuous education, learning, and feedback, the profession can maintain a high degree of competence, integrity, and knowledge.

These concepts are supported in a recent survey conducted by Scott Weinberg (1981) on the Landscape Architecture profession. Weinberg identified 30 emerging trends from the responses to the survey, but there are two trends which are significant to information networks. In one of these trends Weinberg states;

"Landscape architects need to develop new and more effective approaches to practice. These approaches may be the key to the success of the profession in the next decade. Do we begin to develop new approaches to problem solving ? Do we begin to develop new and more efficient use of our time ? Must we be concerned about the way we have communicated... in the past ? If, as landscape architects we can begin to tighten our approaches to problem-solving and communicating, the profession of landscape architecture would let our client groups (and other professions) see exactly what we are, a profession that is constantly trying to improve itself." (p.29)."

The second trend identified by Weinberg relates to the need for continuing education for practitioners in order to maintain high standards in the profession. " Once a practitioner leaves the university which granted him/her the degree of landscape architecture, it is difficult to continue to keep up on the new trends in the profession."

The key to these concepts is communication. The importance of communication is not a new idea. But communicating on computers is a recent development and has distinct advantages over existing methods which support these concepts. These advantages include the availability and speed of information transfer, allowance for time to think before responding,flexible work hours and location and equality of participants, Users also have the option to remain anonymous if desired. Although one may talk about communication taking place between computers, it is the programs within the computers which interact with each other. More particularly, it is the processes in one machine that have to interact with the processes in the other. The future importance of specialized networks for connecting computers lies in the facilities they will provide for efficient interprocess communication between computers. As techniques and standards are developed which facilitate this kind of interaction through a network it will be possible to build computer systems which differ markedly from those available today.

Computer networks are not a new development; the earliest networks were designed simply to connect a number of remote terminals to a single central computer. As the use of terminal access networks increased, it began to be appreciated that there would be advantages in allowing computers to communicate with other computers, as well as with groups of terminals. Depending on whether the computers connected are identical, similar, or dissimilar, it is possible to arrange them to share their resources to a greater or lesser degree. It is now relatively easy to arrange a group of identical computers to share programs and data, and thus greatly increase one"s " computer power." It is much more difficult to achieve any real degree of cooperation between completely independent and dissimilar computer systems, but nevertheless, the presence of a network connecting them enables an exchange of information.

The use of computer networks to enhance the ability of planners and designers to communicate with each other or other information sources has not received much attention as yet. But as computers are increasingly used for planning and design purposes, it is likely that interactions of several people with a common pool of stored information will be important. The widespread use of linked computers to assist professionals in landscape planning, design, and research provides the mechanism for up-to-date information to decision makers, and the opportunity for groups of decision makers to interact closely in solving complex problems. (Chorafas, 1980).

Advances in integrated circuit technology have led to new trends in hardware and software design. Recent efforts have been in the direction of providing techniques for effectively utilizing a large number of regionally distributed microcomputers, and examining the potential of interconnecting them into a viable information system (Martin,1976; Hiltz and Turoff, 1978). The main advantage of this approach is the low cost of the micro-computer and the reliability of the micro-chip technology. An important class of computer network design consists of several micro-mini computers interconnected via standard telephone links and not sharing any storage. In this design the total storage is distributed among the computers and each computer addresses only its private memory. This avoids the complexity of logic required in shared memory and provides an environment in which software processes can be physically separated, which promotes greater reliability, avoids the need for mutual exclusion, and simplifies the design of the system, since all problems associated with multiprogramming are eliminated (Ekanchdam and Mahjoub,1981).

An interactive information exchange network, through the communication of information via microcomputers, can provide a decison support system for land planners and designers.

The key activities within the system should focus on learning, interaction, support, and evolution, rather than replacement, solutions, procedures, and automation. The features and functions of the network to support these activities are the opportunities for teleconferencing, Delphi conferencing, and the ability to send electronic messages to one or many individuals. These functions provide for the integration of existing information resources, development of cooperative research efforts and increased interaction between professionals.

Type of Information Exchanged

It should be stated that the focus here is not to develop a specific database for use in the network, rather it is advocating the need for a microcomputer network as a communication device for information transfer from a user-generated database, independent of whether this database is electronically stored or not. The participants of the network are viewed as autonomous users,each in control of their own information resources. As mentioned previously, this design reduces the problems associated with the incompatibility of hardware and program languages. The problem of information retrieved and stored by each user still exists somewhat, and there needs to be established some basic guidelines to provide a common body of infommation for increased effective communication. The information exchanged could be any important to landplanners and designers, but could include information such as conclusions of design evaluations monitoring of land use changes, results of perception studies, and discussions of current research activities, trends or issues.

In order to gain insight into the type of information the landscape profession felt was important, a survey was conducted at the American Society of Landscape Architects 1981 Annual Meeting. The purpose of the survey was twofold: to determine the interest and experience of the profession in participating in such a network; and to determine what information should be exchanged. 77% of the respondents were practitioners while the other 30% were in university settings. The areas of high agreement from the returned surveys are: all the respondents are interested in participating in the network: none of them have experience with communicating with computer; and they all felt that this is a good time to begin such a network. The responses to the type of information maintained and exchanged are more diverse: the highest agreement (30%) concerned costs and cost estimates; 15% felt that items such as specifications, storm-water controls, and projects/research in progress, would be important. Other categories represented (8%) included energy studies, new technology information, problems from practitioners for classroom use, continuing education courses, and legal and legislative changes. An interesting note is that 23% of the respondents did not know what information should be exchanged at this time within the network, which reflects the inexperience of respondents to this communication technology. The survey questionnaire is available in Appendix B.

An Existing Computer Network

In the microcomputer information exchange presented, the main characteristics of the system are; (1) information generation and storage at user location; (2) transfer of information via electronic messaging and conferencing; and (3) flexibility of numbers of users participating. As more users become aware of and dependent on, system information, the issues of response time, availability, integrity, and ease of access will become increasingly important. Presently, an information exchange network exists which can satisfy these main characteristics of the system, titled EIES (Electronic Information Exchange System). EIES was established in 1976 at the New Jersey Institute of Technology, and as of March 1982 there were over 700 members and 60 groups in the United States, Canada and Europe. The information exchange includes the ability to send messages to individuals or groups, to participate in public or private conferences, to maintain a private notebook for reference material, and to use general bulletins so that information can be spread to the whole system. Specific activities can be searched by keywords, by dates, by sender/receiver, or by a member directory; also, joint editing/authorship of a particular document can be accomplished so that papers can be reviewed, or meeting agendas can be developed among users. In addition, text editing is available to format text and move it around the system. Communication is essentially instantaneous, and if a person signs on at least twice per week then electronic mail delivery is faster than by other means. An additional advantage of the mail aspect of EIES is that when your message is received, you get a confirmation. While initial members to EIES tend to use messages frequently, more experienced users do a great deal of conferencing. Many users can actively particpate (or passively observe) on a specific subject. The typical on-line time for an active user is 15-20 hours per month. (Caldwell, 1982). For an example of the options and functions available to the user on EIES see Appendix C: "EIES Learning Guide for New Users."

In response to the high percentage of the ASLA survey respondents who did not know what information could be communicated on computers, a second survey was conducted on selected users of EIES. The respondents to this survey were selected from a search of the EIES membership directory under the keywords, "landscape-resource-environmental-regional-planning." Of the 700+ members of EIES, 27 names were retrieved from the directory and were sent the abstract explaining the survey. (See Appendix D for text of abstract and survey questionnaire.) Of the 27 names, 23 persons received the survey, and 9 responded. The survey results were as follows: 44% of respondents were involved in human resource development/ management, 56% involved in urban/regional planning;73% had more than three years experience communicating on microcomputer; 62% used EIES on a daily basis, others used it at least once per week; of their time on EIES, 56% was electronic messaging and 50% computer conferencing; 73% found an information network useful, 37% felt it necessary; almost all of the respondents (88%) feel an information network increases the integration and sharing of information, develops cooperative research efforts, provides for increased interaction between professionals, supports process of continuous learning and feedback, and 55% felt it promotes increased understanding of environmental impacts; 75% considered an information network desirable among resource/environmental planners; and 88% felt that a network should be established now, or should have been done sooner. On the questions of type of information communicated and the potential information exchanged, the answers were diverse: 25% used it for proposal writing; 25% teleconferencing preparation and 25% research related; of potential information exchanged on network, 30% of the responses related to education matters, 30% concerned critique/ support of concepts and decisions, and 30% felt information not available in print should be exchanged.

Comments from a few respondents were; "properly selected and prepared resource/environmental planning professionals should benefit from using electronic communications"; "suggest you begin conference with resource/environmental planners and see what happens"; and "Computerized conferencing is single most critical new development for information exchange and collaborative activities."

Though the number of respondents were low, the survey results were very positive concerning computer communication networks in resource/ environmental planning. It is evident that we are still far from the potential of this technology as an aid in decision making and planning.

It would seem appropiate that the initial establishment of an information exchange network for planners and designers be generated on a system as EIES. The reasons for this are: (1) very few of the potential users have communicated on computers, and therefore are uncertain of what to expect from a system; (2) the users are also not sure what information should be exchanged at this point, which makes defining the users requirements very difficult; and,(3) since the system EIES exists, then why "re-invent the wheel" at this point by designing an entire computer informations exchange system until one is certain of the design criteria, related to logical, physical and program design.

A computer-based information exchange network within the landscape architecture profession could enhance and improve our ability for landscape planning and design. The means for increasing this ability is through providing the opportunity for:(1) innovative approaches to complex problems; (2) integration and sharing of information resources; and (3) continuous learning, interaction, and feedback mechanisms. An information network can promote an understanding of the impact/effects of planning and design decisions on the environment, the public's perceptions about such decisions, and the monitoring of plans and designs that are implemented. The information demands of the landscape planner/designer appear to be growing continually. It seems clear that effective information systems are a means of dealing with this increasing demand in information to address the social, biological,and technical issues that arise in planning and design decisions.

CHAPTER 5

DISCUSSION AND CONCLUSION

This thesis may appear as a collection of seemingly unrelated parts, arranged into a single text, proclaiming to provide a "decision process" for landscape planning and design. Admittedly the logic underlying the selection of these two particular activities is not overtly apparent; however, it was demonstrated that individually these two activities can satisfy many of the qualities necessary for an effective decision process. But it is the integration of these two activities which can create a whole greater than the sum of its parts.

The combination of long term monitoring programs and interactive information networks provide a common information base than can be rapidly transferred from one region to another. This information exchanged over time can provide the means for the creation of new knowledge and theory within the landscape profession.

However, no claim is made that these two activities alone are all that is needed to create an effective decision process; rather they serve as the basis from which further connections and concepts can be developed. One direction for further research may include investigating the progress in Artificial Intelligence. Though still at a somewhat simplistic level in practical applications, the research and theory being developed in this field can provide significant insights into the processes of decisionmaking, problem-solving, and creative thinking.

The thesis provided a _description_ of how a computer information network can be applied to landscape planning and design activities; the next step is the physical and logical _design_ of such a system. "Design" means the spcific hardware, software, and structure or achitecture of the system to be implemented. Research is needed to define the software and hardware requirements for a computer network. But before these requirements can be defined, and a design formulated, one one must first identify the users of the system, and define their requirements. Computer technology is not a panacea; it operates under human direction, and therefore provides only what the user wants from it.

There are basically two approaches to identifying the user. One is a "shotgun" approach, where a random number of various landscape professionals go on-line, and after one to three years, an evaluation is conducted to determine who is not using the system, who is, and what information is communicated. This approach has several limitations, and would not produce successful results. A second approachis to organize a group of users based on a specific task or function. This group could be defined at several levels. The group could be an existing committee with specific objectives and goals, such as the ASLA Regional Planning Task Force, or organized at a general level, such as a Landsdape Research Group to discuss on-going and completed research, or the users could be defined on a regional basis such as an Arid Lands Resources Committee. This group could include international arid regions and concerns.

To further define the user group within each of these levels, the concept underlying the University Health Sciences Center could be applied. The U.H.S.C. attempts to bring together medical practitioners, technicians, and researchers into a functioning unit in which research results are applied by practitioners, while also providing a social service to the community. This type of situation, established on a computer network system, could form the basis for an "invisible college," in which existing organizational and geographical barriers are minimized.

Presently, a computer network system is being established within the Agriculture Extension Service Units at Land Grant universities across the United States. There is at least one Extension Service Unit per state which will participate in the system. The system being implemented is DIALCOM, a commercial electronic mail system. The significance of this system is it will allow landscape and environmental studies departments, which are housed within a College of Agriculture, access to a computer information network, and provide opportunities for interaction between geographically dispersed landscape educational institutions. This system is presently being established within the University of Arizona College of Agriculture under assistance of the Computer Applications Group (CAG), directed by Roger Caldwell of the Council of Environmental Studies.

The emphasis thus far has been describing a network system bringing together planning and design professionals in wide geographic locations. But a computer network can also be effective for communicating between adjacent offices or buildings. In other words, an electronic mail system can also be established within a Division, the School, or at the College level. An example of an interdepartmental messaging system has recently been implemented within the Management Information System Department in the Business and Public Administration College.

This summary has attempted to demonstrate that the potential purpose and structure of a computer-based information network are unlimited. The difficulty lies in discerning the purpose and expectations of the users in such a system. Based on personal observation and research, a successful user group may be defined as a group of Arid Land resource planners and specialists, composed of practitioners, researchers, scientists, and resource managers, for the purpose of increasing the rational scientific management, planning, and design of these fragile, and increasingly developed regions.

Conclusion

It is difficult to formalize a final conclusion on a subject whose only constant is change. There are "concluding remarks" that can be stated, but they are actually the present results and observations of an evolving process. This thesis concerned an examination of the requirements for a defined decision process for landscape planning and design. The establishment of a decision process requires a common body of knowledge, built on empirical research, and supported by a theoretical foundation.

A decision process for landscape planning and design should be problem-centered, futures oriented, incorporate continuous learning and feedback mechanisms, allow for group processes and interactions, and be flexible to respond to a changing decision environment. The thesis demonstrated how an understanding of uncertainty in planning and design decisions can support the means for this process to occur. Two responses to uncertainty which support this decision process are long term resource monitoring and a computer-based information exchange network. Long term monitoring can: identify planning and design problems and determine the information needed to address those problems; utilize a futures approach; and collect long term measurements and data to detect changes and determine trends. An interactive information network can: incorporate continuous learning and feedback; allow for group processes; and, provide for the communication, integration, and sharing of information processes.

Though it will be several years before long term resource monitoring information is available, and an information exchange network is established for landscape planning and design purposes, it is important to recognise the inevitability of these activities if the profession is to survive and progress into the future. We stand at a threshold, and only by preparing for the challengs of the 21st. century will the profession be recognised as a significant force shaping society's future.

APPENDIX A

ANNOTATED BIBLIOGRAPHY ON MONITORING[4]

Behav, C. 1979. "Integrated Exposure Assessment Monitoring." Environmental Science and Technology 13:1:34.

Article advocates a systems approach to provide the data required for strategic control of critical sources of pollutants that cause major problems or threats to critical receptors. A critical receptor is that segment of the human population that is affected by a pollutant.

Bisselle, C.A. 1971. Monitoring the Environment of the Nation."Council on Environmental Quality, Washington, D.C. NTIS PB 205989.

Report provides a design concept for a system to monitor the nation's environment; includes a description of priority indicators and identifies major gaps in existing monitoring programs. An objective of the design is to provide decisionmakers with appropiate environmental data which will characterize the state of the environment and assist in evaluating environmental impacts.

Blodgett, J.E. 1979. " Environmental Monitoring."U.S. Library of Congress Congressional Research Service Report 1B78021. Washington D.C.

The U.S. does not presently have a comprehensive national environmental monitoring program. Three forms of monitoring are described which are required for such a program: (1) ambient monitoring,

4.The author expresses gratitude to Kevin Noon for his assistance in compiling this bibliography.

(2) effects monitoring, (3) and source monitoring.

Proposes that the U.S. first establish a prototype monitoring prog m before implementing a national program.

Brickler S and B. Tunnicliffe. 1980. Water Quality Analyses of the Colorado River Corridor of the Grand Canyon. University of Arizona College of Agriculture. Paper 350.

Report documents baseline water quality studies of the Colorado River and tributaries, Purpose is to provide resource agencies and commercial river runners a perspective of water quality status as it relates to river running activities.

Dorsey, J.A. 1979. A Phased Approach for Characterization of Multimedia Discharges from Processes. In Monitoring Toxic Substances, D. Schuetzle (ed.).

Described a "phased approach" to environmental assessment sampling as opposed to a direct approach. In a phased approach, all streams would first be surveyed using generalized sampling in order that the streams be ranked on a priority basis.

Diem, K.L. 1976. Avian Monitoring and Rapid Information Retrieval System. Wildlife Technical Report No. 5. Wyoming Game and Fish Dept., Cheyenne,

The organizational framework and the methodology for a stqndardized statewide avian census are presented. The procedures will be utilized to provide the following information on Wyoming breeding bird populations: species composition, density, relative abundance, breeding diversity and rest site characteristics.

Dyett, M.V, 1978. Recommendations for Long-Term Monitoring. Metropolitan Transportation Commission, Berkely, CA. NTIS PB291016.

Examined and evaluated the options for monitoring the impacts of the BART System on land use and urban development. These impacts were related to policy-making, long-range planning, and information collection. Report was significant in that it dealt with how people's behavior will change due to an impact such as a transportation system.

Environmental Monitoring and Data Acquisition Group. 1974. Recommendations for a Critical Resource Information Program (CRIP) for Wisconsin. University of Wisconsin, Madison.

Program describes the role of monitoring critical resources in developing a CRIP in Wisconsin. Mechanisms used in monitoring these resources are remote sensing to detect current changes, and the use of public records to predict impacts at a critical area.

E.P.A., Environmental Monitoring Series, "Development of a Biological Monitoring Network - A Test Case." EPA, 1975.

A monitoring network was designed to establish baseline pollution levels in fauna of Western Utah and to evaluate the suitability of using livestock and wildlife as biological monitors of pollution contaminates. The authors recognize a need for an integrated monitoring program and use wildlife as biological monitors.

Floyd, M. 1978. " Structure Plan Monitoring.: Town Planning Review. 49:4:476.

Article advanced the idea of a goal of monitoring was to ensure that the development of an area conformed to the planned pattern of land use. Also advocated "policy-monitoring" in the same sense as the "plan-monitoring" described.

Franklin, J.F. and S.L. Krugman,1979. Selection,Management and Utilization of Biosphere Reserves. USDA F.S. Gen. Tech. Rot. PNW-82. Report is the result of a U.S.-U.S.S.R. symposium on Biosphere Reserves. Project recognised the common interest in establishing Biosphere Reserves as sites for ecological research and environmental monitoring programs.

Gardner, J.S., Jan. 1972, A Study of Environmental Monitoring and Information Systems, Institute of Urban and Regional Research, Iowa City, Iowa.

This text describes the development of operational and planned schemes applicable to the measurement of environmental change. The status of remote sensing or data collection and the organizational structure of an environmental information system are among the major issues discussed.

Johnson, W.C. and S.P. Bratton, 1978. " Biological Monitoring in Unesco Biosphere Reserves, Bio. Conser. (13) Applied Sci. Pub. Lt., England.

This report discusses guidelines for predicting change, monitoring to test the predictions, and interpretation of data from monitoring. The system of prediction, monitoring and assessment will serve to provide proper context for most monitoring activities in biological monitoring programs in the newly established biosphere reserves.

Lenihan, J. and W. Fletcher (eds.).1978. Measuring and Monitoring the Environment. Blackie and Son Ltd., Glasgow.

Outlined various methods and measurements for monitoring the environment, including biological, physical, and chemical methods. Chapter on use of hair as a mirror of the environment was included.

Marcus, L.G. 1979. "A Methodology for POST-ELS Monitoring." USGS Circular #782. Washington, D.C.

Developed a methodology for monitoring the impacts which were predicted on an EIS for phosphate development in Idaho, in order to determine how close the actual impacts were to those predicted.

Martin, C.S. and D.R. Gable, 1974, Managing Semi-desert Grass-shrub Ranges, Vegetation Responses to Precipitation, Grazing, Soil Texture, and Mesquite Control, U.S. Department of Agriculture, Forest Service.

Fourteen different types of forage grasses and shrubs were monitored for production under various degrees of precipitation, grazing, soil texture, and mesquite control. The model 10 year project was extremely successful in determining exact percentage change in forage production from year to year with varying conditions. Methods of study and results are fully explained.

Morgan, G.B. 1978. Energy Resource Development: The monitoring Components. Environmental Science and Technology. 12:1:37.

Described EPA's efforts to establish a multimedia inter-disciplinary approach toward evaluating the total effects of energy development on our environment. Involved eight federal agencies in developing a compatible data base to determine source, transport, and fate of environmental pollutants.

National Research Council. 1977. Environmental Monitoring. National Academy of Sciences. Washington, D.C..

Study by the Council gave an overview of the Environmental Protection Agency's current monitoring activities. Several recommendations were stated by NRD to improve monitoring programs under EPA.

National Science Roundation, 1977. Long-Term Ecological Measurement. Report of a Conference, Washington, D.C.

Publication is a report of a conference which provides the need for long-term ecological studies, Report outlines what factors should be monitored with respect to terrestial, freshwater, and marine ecosystems.

National Science Foundation, 1978. A Pilot Program for Long-Term Observation and Study of Ecosystems in the United States. Report of a second Conference on Long-Term Ecological Measurements.

Report continued from work of previous conference, describing where monitoring sites should be located within terrestial, freshwater, and marine ecosystems to ensure representative sampling of those ecosystems.

Noll, Kenneth E. and T.L. Miller, 1977. Air Monitoring Survey Design. Ann Arbor, Michigan.

The objective of this book is to present the information necessary to establish a comprehensive air monitoring program. In addition to addressing the subjects of equipment selection, calibration, and operation, the book presents information on the selection of monitoring sites, the integration of air and meterological monitoring programs, and the establishment of a quality assurance program.

Pack, D. 1975." Background Monitoring,(Hawaii, Alaska, Samoa, Antartica) the Last Two Years, " International Conference on Environmental Sensing and Assessment; Conference Proceedings, Las Vegas, Nevada. This report is a summary description of an integrated program of field observations, quality control and interpretative activities organized as National Oceanic and Atmospheric Administrations Geophysical Monitoring for Climatic Change Program. The paper describes procedures establishing a set of measurements that would define the amount, variability and trends of important trace constituents in the atmosphere.

Robers, J.D. 1978. "Principles of Land-Use Planning." in R.C. Dinauer (ed.) Planning the Uses and Management of the Land. American Society of Agronomy, Wisconsin.
Paper presents an overview of the planning process and its associated activites, The significance of the paper is that he believes monitoring plays an important role in this process, A good review of purposes for monitoring is given.

Schaeffer, R.G. 1977. Monitoring the Human Resources. The Conference Baord, N.Y.
Corporation personnel executives should consider employees as human capital in human resources accounting. Personnel managers need to monitor and manage the effective utilization of available human resources in conforming to corporate plans.

Schneider, R.G. 1977. Monitoring the Human Resources. The Conference Board, N.Y.

Presented four case studies to illustrate how environmental monitoring and regional planning are the instruments for creating living conditions that respond to social, economic and cultural requirements. This was accomplished through remote sensing, which may inventory land-use, monitor land use changes, detect land use conflicts and detects air and water pollution and landscape damages.

Sebesta, P. and R. Arno. 1979. Wildlife Monitoring Program Plan. NASA. Washington, D.C. NTIS N79- 23626.

Document presents a plan for integrating the various requirements for wildlife monitoring using modern aerospace technology. Objectives are to monitor the location, physiology, behavior and habitat of selected animal species, and determine the appropiate role of aerospace technology in monitoring wildlife resources.

Sittig, Marshal, 1974. Pollution Detection and Monitoring Handbook. Noyes Data Corp., New Jersey.

The author first presents a brief section on air pollutants and general monitoring procedures. He presents the various types of existing analytical systems, compares them, and presents criteria that a user should consider in selecting a system. The second section of the book is a presentation of monitoring techniques for a multitude of atmospheric pollutants. The sections for each pollutant contain a brief introduction to its sources, toxicity, and environmental significance followed by techniques for its measurements.

Sors, A.I., 1977. "MARC-Center for Environmental Assessment: Environment, Science and Technology vol. 11, #12.

This report describes philosophies of the Monitoring and Assessment Research Center (MARC) in London. The objective of MARC is to consolidate and advance the understanding of environmental processes and thereby aid in the design of monitoring systems for environmental management and research.

The Institute of Ecology, 1977. Experimental Ecological Reserves: A Proposed National Network. National Science Foundation, Washington D.C.

Aim of the study is to establish representative ecosystems of the U.S. which may be used for experimental long-term research. Report describes the management structure for EERs, and the coordinating mechanism for the network.

The Institute of Ecology,1979. Long-Term Ecological Research. Concept Statement and Measurement Needs. National Science Foundation. Washington D.C.

Report describes the justification for long-term ecological studies outlining the physical, chemical and biological measurements which are required in terrestial , freshwater and marine ecosystems. TIE sought to satisfy the need for integrated long-term monitoring of interactions among ecosystems.

Wielgolaski, F.E. 1975. Biological indicators of Pollution. Urban Ecology 1:1:63:-80.

This paper indicates some of the more useful biological indicators of pollution and reviews a number of criteria that must be evaluated in order to choose the biological indicator for a study.

Wiersma, G., K. Brown, and A. Crodkett. 1978. "Development of a Pollutant Monitoring System for Biosphere Reserves." EPA. Washington, D.C.

Authors outlined what they felt to be relevant parameters in monitoring biosphere reserves. Used Kings Canyon N.P. and Yellowstone N.P. as surrogates of biosphere res., describing an approach as to how these should be monitored.

APPENDIX B

A.S.L.A. SURVEY QUESTIONNAIRE

The purpose of this survey is to determine interest from participants at the 1981 A.S.L.A. Annual Meeting regarding involvement in a computer-based information network.

The network would consist of planners, designers, and other interested professionals in various regions across the United States, each collecting their own regionally appropiate information, and exchanging this information with other participants in the network. The purpose of this network is to achieve a better understanding of the effects/ impacts of design and planning decisions on the environment, the public's perceptions about such decisions, and the monitoring of concepts that are implemented.

The information exchanged could be any data important to Landscape Architects, but to take full advantage of the network, information such as conclusions from design evaluations, monitoring of land-use changes, results of perception studies, or discussions of current research activites, trends, or issues, could be exchanged. Advantages of the information exchange network are availability and speed of information transfer, integration of existing resources development of cooperative research efforts, and increased interaction between professionals.

Please respond to the questions below so that an understanding is achieved of what professionals feel would be important in such a network.

I. Would you be interested in participating in such a network ?

2. What type of information do you feel should be maintained in this network ?

3. Have you any experience with computer network communication ? If so, how much ? (Example: 2 years of occasional use)

4. Do you feel this is a good time to begin an information network, or is it too late or too early ?

5. Comments.

6. Please give your name and address below to receive outcome of survey and further information regarding network.

APPENDIX C

EIES LEARNING GUIDE FOR NEW USERS

This Learning Guide was developed by several people using the Electronic Information Exchange System of the New Jersey Institute of Technology. It is intended to be an overview on how to proceed in a non-structured approach at your own pace in using the EIES system.

ITRODUCTION

The EIES system is dynamic and constantly changing, since computerized conferencing is a new and evolving technology, and since EIES is a field trial operation dedicated to attempting new applications evaluating their success or failure and evolving user features needed to enhance specific applications. From 1976 through 1980 the number of features composing the EIES system has increased approximately four-fold. In addition a significant number of subsystems have been added which encompass structured communications for users far beyond the basic MESSAGE and CONFERENCE systems used by all EIES members.

To compensate for this richness and the sometimes overwhelming effect it can have on new users, EIES is highly " segmented" in terms of its interface design. That means that the user need learn only about the specific EIES features needed. Also EIES encourages learning by "trial and error"; users are encouraged to try new things and can be assured that their learning mistakes will not provide any significant difficulties for them or other users.

What follows is a set of levels of learning accomplishment for users. They are based in large part on the experiences of other users. Each level is meant to represent three to six hours of reading and practice. The description at each level provides a series of tasks for you to accomplish and some guides as to what information you may wish to print out and read at that level.

If your use of EIES is limited, you may have no interest in advancing behond level II. In such a case the changing nature of EIES will have little impact on you as the features of straightforward MESSAGING and CONFERENCING are now fairly static, However the dedication of EIES to evolution and exploration of the technology does mean you may encounter errors, slow response, down time and crashes. EIES does not claim the stability of a commercial service nor on the other hand, does it charge comparable commercial rates. However, it has been our experience that the reliability of EIES is not really worse than is the case fo.·the average commercial service.

We hope all of you will enjoy this opportunity to explore the future with us. The Users Consultants and others connected with the EIES operation are always glad to do what we can to aid in increasing your knowledge of EIES and relating it to your potential applications. Any feedback you can provide us (by messaging 110 or using the appropiate public conference) on your own experiences, difficulties,successes, problems and suggestions is useful to us.

LEVELS OF LEARNING

LEVEL 1: MENU INTERACTION AND MESSAGING

Send a message to yoruself, complete directory information, find others in the directory, retrieve current newletter (CHIMO),work through several menu operations (including explanations, directory, messages) use ?, ?? and ? word. Send a test help message with ??? (indicate it is a test), send a regular message to the User Consultants, (HELP,!!)), learn the use of +, ++ and -.

Use MESSAGE CHOICE 1 and 2 to retrieve the message you sent yourself using its identification number: then use MESSAGE CHOICE 5 to first MODIFY and then DELETE it. (You can try to retrieve it again to see if you were successful.)

If you are not using a hard copy terminal, learn +SLP. Use +SSM to turn off the printout of menus when ready, and try a carriage return at a CHOICE point instead. If you want to control you message delivery further, enter? + SAM for further information. Other explanations you may want to get on-line are obtained by entering:

?WORD	How to learn about any command on the system
?MESSAGE	How to communicate directly and privately with others.
?DISPLAY	How to scan headers quickly.
?DELETE	How to delete items.
?USERCONSULTANTS	How to get human help.
?SYSTEM MONITOR	how to transact business with the EIES staff.

?CHIMO How to keep up with news of activities on EIES.

?DIRECTORY How to learn about others on the system.

?EXPLANATION How to learn about features of the EIES system.

?SCRATCHPAD How to compose text.

?CHOICE How to get around on the system.

?+ON How to learn who else is on line at the moment.

?+FNAME,?+WHO How to locate others on the system.

?+SEN:How to communicate instantaneously or in one-line messages.

?+CNM,?+CM How to compose messages most easily.

?+SSM How to turn off the menus.

?+SAM How to get messages delivered automatically.

?+SLP, ?+SNLP How to set line pause and turn it off.

LEVEL II: CONFERENCING AND INITIAL DIRECT EDITING

Review current public conference (enter+DPC) and look at comments 1-3 in Conference 1008. Print out some recent comments in a public conference and set a marker in a public conference. Practice some simple text editing in your scratchpad using: :: :- = * / and . Learn to copy messages or conference comments into your scratchpad and edit them. You can use public conference 1000 for practice. Learn about ASSOCIATIONS and KEYS. Print out the CHIMO INDEX and retrieve articles of interest to you. Try to set up a table in your scratchpad by using.TABS. Try making up some commands from the Chinese command menu and see what they do. If you make up a command you can enter ?command to see if an explanation is available. Try a search of keys in a conference by retrieving an item you already know is there. Useful explanations for these exercises can be obtained by entering:

?CONFERENCE How to participate in conferences.

?ASSOCIATION How to link your item with another item.

?KEYS how to give an item a title.

?COMPOSE How to compose text.

?CHIMO How to -find back items in the CHIMO newsletter.

?COMMANDS How to get a list of system commands.

?COPY How to copy text from anywhere on line to anywhere else.

?DIRECT EDIT ,?: - How to edit text in the scratchpad.

?TABLES How to construct tables, charts and tabs.

?SEARCH How to locate items by author, keyword, or association.

?OPEN CONFERENCES How to locate private conferences open to new members.

?+SCM How to set a marker in a conference.

?+OPC How to list public conferences.

?+LINK How to talk to people in real time.

?+SAC How to change your access code easily.

LEVEL 111: MORE EDITING AND SELF DEFINED COMMANDS

Practice moving text and portions of text between storage areas and scratchpad, develop user-defined commands(+DEF), use messages with abstract (.RETURN/READ), modify (edit) messages you have written, and interact with other groups or conferences (either public or private). learn about NOTEBOOK and REMINDERS.

learn how to REVIEW the status of your conferences and your activity and to obtain all your waiting conference comments with one command (+GWCI). Learn how to address any text ITEM within a command and commands that use that feature such as +GET. Explanations for the above are available from:

?NOTEBOOK How to use your personal or collaborative text-writing space.

?STORAGE AREA How to temporarily store text items

?INDIRECT EDIT How to format your text for others to read or whether to read it at all.

?REVIEWS How to survey the statistics for your system use.

?MODIFY How to change items you have already entered.

?. RETURN, ?+SUBMIT, ?+READ How to provide a summary of your item and a choice.

?+DEFINE How to compose your own customized commands.

?+GET How to read an item without entering the conference or notebook.

?=GWCI How to automatically scan your conferences for new items.

?GWNI How to automatically scan your notebooks for new items.

?REMINDERS How to store one-line reminders for yourself on line.

LEVEL IV: DOCUMENT HANDLING AND OTHER FEATURES

Request a private notebook from 100. If you are a Class One user. Learn about the+SUBMIT command, look at PAPER FAIR Conference 1017. Review your EIES instructions (and etiquette). Printout the explanation index (?EINDEX) to find out what else you might like to learn. Get orgainzed and try not to overload yourself by trying to get active in everything on EIES. Learn about +INTERESTS. Learn how to control the printout or material. Have a little fun with some of the GAMES. Try making a RECORD of your own DEMO of EIES. Material for this is found by entering:

?GAMES How to play a number of on-line games.

?VOTING How to vote in conferences.

?INDEX Howt to get a lisitng of all explanations available on line.

?RECORD How to record a demo session.

?.GET How to copy items into the text of your items.

?.SEE How to copy items to people who may have already seen them.

?+SPAGE How to control the printout of material.

?+LISTNEAT How to print text without headers, as for a paper.

LEVEL V: EXPLORING

Look at some EIES applications by entering ?FACT SHEETS.

Look at some of the special communication structures now in use by various groups on EIES by entering:

?TOUR ?TOPICS ?SUBACCOUNT ?TERMS ?INTERACT

Look at some of the policies and other information by entering:

?UC POLICY ?EIES ACCESS

If you are a group coordinator or conference moderator, you will want to print out:

?COORDINATOR ?MONITOR ?GROUP ?BILLING GROUPS ?GROUP COMMANDS

?FACILITATOR

PLEASE FEEL FREE TO SEEK CLARIFICATION FROM YOUR FRIENDLY USER CONSULTANTS FOR ANY OF THE EXPLANATIONS HERE. INITIAL CHOICE?

APPENDIX D

EIES SURVEY ABSTRACT AND QUESTIONNAIRE

M 28447 ROGER L. CALDWELL (UNIV-AZ,795) 4/3/82 7.35 PM L:6
KEYS:/ABSTRACT OF ONE PAGE QUESTIONNAIRE/RESOURCES/USE + READ/

Type + READ (of this item) to get the entire text of the paper described below.

I am writing to ask if you would complete a brief questionnaire regarding resource and environmental planning in relation to electronic communication. This work is being done by a graduate research assistant in Landscape Resources at the University of Arizona (Charles Deans).

Your name was selected from the EIES directory on terms involving planning, environment, regional, resource or land use. We are sending this as an abstract with the full one page questionnaire (about 10 minutes) available with a +READ using M#####, where ##### is this message number.

I have assisted Charlie in some interactions with EIES and he is quite interested in your responses, as you represent current users of a communication technique he believes will be significant in future resource planning activities. The results of the survey will be available in return for your participation.

Results will be tabulated on April 30th. Thanks for your participation.

SURVEY QUESTIONNAIRE

This survey will take about 10 minutes and addresses the use of computer based information exchange networks to support land use and environmental decision making. Please answer the questions by a message to 795. Write the question number followed by appropiate response, either letter(s), or short answer (e.g. 2B).

1. What is your professional area of interest or occupation?

2. What is your experience with computer communications?

   A. Less than one year.
   B. Between one and three years.
   C. More than three years.

3. What is your frequency of use of computer communications?

   A. Light use (sign-on once/twice per month)
   B. Moderate use (sign-on once/twice per week)
   C. Heavy use (sign-on daily)

4. Of your time on EIES, messaging is ?? % and conferencing is ?? %.

5. Regarding your professional activities, do you find an interactive information exchange network:

   A. Useful
   B. Necessary
   C. Inappropiate
   D. Not useful

6. Do you feel that an interactive information network supports any of the following? (List as many as appropiate)

   A. Increases the integration and sharing of information
   B. Develops cooperative research efforts
   C. Provides for increased interaction between professionals
   D. Supports process of continuous learning and feedback
   E. Promotes increased understanding of environmental impacts.
   F. Other (Specify).

7. Do you feel an interactive information network among individuals involved in resource or environmental planning is:

   A. Needed
   B. Desirable
   C. Neither A or B

8. If response to question 7 is A or B, then when is the best time for such a network to be established?

   A. Now is a good time.
   B. It is too soon.
   C. It should already have been done.

9. What type of information do you most often communicate on the network?

10. What type of potential information do you feel could be exchanged on such a network if it were established(i.e.resource/environmental planning)?

11. Other comments.

12. Would you like to receive the results of the survey(as a +READ on EIES)? Yes or No.

THANK YOU FOR YOUR CONSIDERATION

REFERENCES CITED

Andrews, R.N.L. and M.J.Waits. 1978. Environmental Values in Public Decision: A Research Agenda. Michigan: University of Michigan Press.

Ayres, R.A. 1969. Technological Forecasting and Long Range Planning. Greenwich, Conn: Fawcett-Crest.

Becker H.B. 1973. Functional Analysis of Information Networks. New York. John Wiley and Sons.

Borch, K. and J. Mossin. 1968. Risk and Uncertainty. New York. McMillan Books.

Bormann, F.H. and G.E.Likens. 1979. Pattern and Process in a Forested Ecosystem. New York: Springer-Verlag.

Boroush, M.A., K. Chen, and A.N.Christakis. 1980. Technology Assessment: Creative Futures. New York. North Holland.

Brown, L.R. 1978. The Twenty-Ninth Day. New York. W.W.Norton and Co.

Caldwell, R.L. 1982. The Coming Role of Computer Conferencing. Plant Disease. vol. 66: 3:193:98

Chenoweth, R.E. 1980. Research in Landscape Architecture: An Extended Definition. Proceedings of CELA: Research in Landscape Architecture. Madison. University of Wisconsin.

Chorafas, D.N. 1980. Computer Networks for Distributed Information Systems: New York: MacMillan Books.

Council on Environmental Quality (CEQ). 1973. Monitoring Directory of Federal Agencies. Washington, D.C.

Dalkey, N.C., D.L.Rourke, R. Lewis, D. Snyder. 1972. Studies in the Quantity of Life: Delphi and Decision-Making. Massachusetts: Lexington Books.

Davis, D.R. 1971. Decision Making under Uncertainty in Systems Hydrology. Ph.D. Dissertation, University of Arizona, Tucson.

Dyckman, T.R. and A.K. McAdams, 1969. Management Decision Making under Uncertainty.London: McMillan Co.

Ekanadham, K and A. Mahjoub, 1981. Microcomputer Networks. The Computer Journal. vol. 24:1:17-24.

Fabos, J.G. 1979. Planning the Total Landscape. Boulder, Colo. Westview Press.

Fabos, M.G. and M. Gross. 1981. A Tool for Participatory Landscape Planning. In Regional Landscape Planning, J. Fabos, (ed.) Washington, D.C. American Society of Landscape Architecture.

Fildes, R.M., Jalland and D. Wood. 1978. Forecasting in Conditions of Uncertainty. Long Range Planning, vol. II:II:3:29-38.

Floyd, M. 1978. "Structure Plan Monitoring." Town Planning Review. 49:4:467-76.

Gardener, J.S. 1972. A Study of Environmental Monitoring and Information Systems. Institute of Urban and Regional Research,Iowa City, Iowa.

Gregg, F. 1981. Making Large-Scale Public Land Transfers Happen: The Case for a Westwide Program Based on FLPMA. Washington, D.C. The Conservation Foundation.

Halter, A.N. and G.W. Dean. 1971. Decisions Under Uncertainty. Ohio: South-Western Publishing.

Harmon, W. 1976. Incomplete Guide to the Future. San Francisco. San Francisco Book Co.

Hecht, M.E. and R.W. Reeves. 1981. The Arizona Atlas. Office of Arid Lands Studies, University of Arizona, Tucson.

Hiltz, M.R. and M. Tur off. 1978. The Networking Nation: Human Communication via Computer. Massachusetts: Addison-Wesley.

Johnson, W.C. and S.P.Bratton. 1978."Biological Monitoring in UNESCO Biosphere Reserves." Bio. Conser. (13) Applied Sci. Pub. Ltd. England.

Kaplan, R.W. 1979. Notes on a Workshop on Risk Analysis and Decision Making Under Uncertainty. NTIS Conf. 78 0847-1.

Koh, J. 1980. The Role and Importance of Theoretical Research in Environmental Design. Proceedings of the Council of Educators in Landscape Architecture: Research in Landscape Architecture. Madison: Univ. of Wisconsin.

Maki, A.W. 1980. Short Term Organization of Biological Monitoring Methods. In D.L. Worf (ed.) Biological Monitoring for Environmental Effects. Massachusetts: Lexington Books.

Marcus, L.G. 1970. " A Methodology for Post-EIS Monitoring: USGS circular #782, Washington, D.C.

Martin, J. 1976. Telecommunications and the Computer. New Jersey: Prentice-Hall.

Matter, W., J. LaBaume, J. Cartner, D. Wilkin, and M. McCarthy.1981. Problem Identification: Premises and Procedures. Long Term Resource Monitoring Report #2. Tucson: University of Arizona.

McCarthy, M.M., E.H.Zube, and C.B.Deans. 1981. Long Term Monitoring and Landscape Planning. In Regional Landscape Planning, J. Fabos, (ed.) Washington, D.C. American Society of Landscape Architects.

McHarg, I.L. 1969. Design With Nature. Garden City, N.Y. Natural History Press.

McKenna, C.K. 1980. Quantitative Methods for Public Decision Making. New York: McGraw-Hill.

Michael, D.N. 1973. On Learning to Plan and Learning to Plan. San Francisco: Jossey Bass.

Naisbett, J. 1980. Survey of Emerging Trends, Business Tomorrow, vol.3:2:1:8-12.

National Science Foundation (NSF). 1978. A Pilot Program for Long-Term Observation and Study of Ecosystems in the United States. Washington, D.C.

Niemann, B.J. 1980. A Proposal for a Ph.D. in Landscape Architecture. Proceedings of CELA: Research in Landscape Architecture.Madison: University of Wisconsin.

O'Neil, R.V. and R.H.Gardener. 1978. Sources of Uncertainty in Ecological Models. NTIS-ORNL-780847.

Pirages, D.C. and P.R. Ehrlich, 1974. Ark. II.San Francisco: W.H. Freeman and Co.

Roberts, J.C. 1980. "Principles of Land-Use Planning."In R.C. Dinauer (ed.) Planning the Uses and Management of the Land. American Society of Agronomy, Wisconsin.

Rooney, J.W. 1971. A Survey and Critique of Technological Forecasting Methods. Masters Thesis, Naval Postgraduate School, Colorado.

Schlaifer, R. 1969. Analysis of Decisions Under Uncertainty. New York: McGraw-Hill Books.

Schlon, D.A. 1971. Beyond the Stable State. London: Temple Smith Ltd.

States, J.B. et al. 1978. A Systems Approach to Ecological Baseline Studies. U.S. Fish and Wildlife. Washington, D.C.

The Institute of Ecology, 1979. Long-Term Ecological Research. Concept Statement and Measurement Needs. National Science Foundation, Washington, D.C.

Theobald, R. 1967. Beyond Despair. New York:McMillan Books.

Toffler, Alvin, 1980. The Third Wave. New York: Bantam Books.

Waller, J.D. 1976. Monitoring for Government Agencies. The Urban Institute, Washington, D.C.

Weinberg. S.S. 1981. Focus on Landscape Architecture: A Survey of the Profession. Washington D.C. Landscape Architecture Foundation

Zube, E., R. Brush and J. Fabos. (eds.) 1975. Landscape Assessment: Values, Perceptions and Resources. Pt. 3. Stroudsberg, Pa. Dowden, Hutchinson and Ross.

Zukav, G. 1979. The Dancing Wu Lee Masters. New York: Bantam Books.