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In addition to founding and leading Inquiring Systems INC (ISI) since 1978, Dr. Cole is an award winning keynote speaker, and author of numerous articles and papers. Among his many accomplishments his favorite includes the creation and development of the first systemic & interdisciplinary Environmental Undergraduate and Doctoral Program in the Conservation & Resource Studies Department at U.C. Berkeley. His doctoral dissertation: Stuart Loren Cole, “Implementation Aspects of an Ecosystems Approach: The Conservation of Natural Resources [CNR] Program, University of California, Berkeley: 1969-1972” (© 1975) is reproduced here by permission of Loren Cole, July 25, 2017.

Loren also helped co-found the first urban recycling center in the US and the Berkeley Ecology Center. He has also designed and built an active and passive solar home (see below), raised hundreds of millions of dollars for his clients, and educated over 26,000 industry leaders in the area of Ethically Sustainable Ecosystem Management. For information and inspiration on how to implement the goals of Inquiring Systems, see

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Implementation Aspects of an Ecosystems Approach:
The Conservation of Natural Resources Program,
University of California, Berkeley: 1969-1972

By

Stuart Loren Cole

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M.S. (University of California) 1970

DISSERTATION

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Approved:

Arnold M. Schultz

C. West Churchman

Robert P. Biller

Committee in Charge

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"The wind, too, scattered seeds. As the water reappeared, so there reappeared willows, rushes, meadows, gardens, flowers, and a certain purpose in being alive. But the transformation took place so gradually that it became part of the pattern without causing any astonishment. Hunters, climbing into the wilderness in pursuit of hares or wild boar, had of course noticed the sudden growth of little trees, but had attributed it to some caprice of the earth. That is why no one meddled with Elzeard Bouffier's work. If he had been detected he would have had opposition. He was undetectable. Who in the villages or in the administration could have dreamed of such perseverance in magnificent generosity?"

From: "The Man Who Planted Hope and Grew Happiness." By Jean Giono.

The proposition of this dissertation is that within the development and operation of the Conservation of Natural Resources Program (CNR) at the University of California at Berkeley, certain events transpired which have value in identifying and understanding the behavior of an ecosystems approach. The central theme is a description and explanation of how this particular structure came about and what patterns of behavior were necessary to make it effective. The purpose for doing so stems from the realization that usual and traditional methods for dealing with complex and highly interrelated environmental issues fail to reveal their character. Societal needs must be matched with appropriate societal capabilities.

As the concern for environmental conditions began to expand in the late 1960's there occurred a parallel recognition that our present problem-solving capabilities were inadequate to cope effectively with these situations. The most dominant response was an increased demand for more and better information. It was not recognized that this information would be of little value if it could not be effectively utilized. The real issue revolved around the need for an entirely new conceptual framework, one in which the totality of the situation could be conveyed.

The CNR program emerged, in part, as a response to this need and concern. It is incomprehensible to me that I should be describing what happened in its development. The implications, both real and imagined, of what occurred will never be fully exposed or understood. The best that can be done is to display some patterns of perception which, hopefully, will provide insight into a portion of the CNR community. The explicit translation of any process from reality to description is a risky exercise. As in any condensation it comes about through evaporation from the whole. No matter how small a portion is lost in the process, it is still a distillation and its inherent properties are lost.

In the search for format that would convey my impressions, I went through a number of difficult transitions. Each possible approach lacked something. The three areas of major concern were cohesiveness, continuity and consistency. No real pattern emerged to guide the discussion. Definitions were inappropriate because they tended to confuse rather than clarify. It seemed that each description would designate a specific level of resolution which could be understood only from a very narrow range of paradigms. The procedure finally selected is characteristic of the process I'm attempting to describe in that it merges out of the context of the process itself. Each facet of the discussion seems to merge from, with and back into the others. The process must be <u>centered</u> and I must be <u>centered</u> within the process.

> "Centering is the image I use for the process of balance which will enable us to step along that thread feeling it not as a thread but a sphere. It will, it is hoped, help us to walk through extremes with an incorruptible instinct for wholeness, finding our way continuous, self-completing. This thread can be as limber as breath. It is tough as a wild grape vine. Continuity, of movement and variation and organic process and appearing and disappearing and fruitfulness and withering and seeding, lives in the image of the vine . . ." (Richards, p. 6)

It is through the pattern of interconnection that the whole is illustrated - something of a scanning process. Reflections appear from certain points of reference; these focus our perceptions. They are the attitudes that formed the basis of this approach and guided the selection of the material. I felt something like Niels Bohr who when he first tried to describe the atom said that his concern was in "not describing facts but in creating images."

Somehow factual and structural descriptions fail to convey the essence of the CNR process. Descriptions of this kind provide the elements and entities that constitute the physical properties but fail to convey the character of the implementation aspects of the effort. So much has been said within the field of systems theory but so little has been directed towards how these concepts and processes can be utilized.

DEFINITIONS ABOUND AND THEIR INTERPRETATIONS ASTOUND.

One more listing of criteria and definitions would add little to our ability to think and act systemically. What seemed to be appropriate was some interpretation of how and what was happening within the practical application of the approach. Somehow this method must expose the nuances of interaction. The form of the description should reveal as much as the content itself. Alan Watts also expressed a similar concern in the prologue to his biography, "In My Own Way."

> "As I am also a you, this is going to be the kind of book that I would like you to write for me. It is not going to be in the linear dimension, since I do not subscribe to the chronological or historical illusion that events follow one another on a one-way street, in series. We think about them in that way because that is how we have decided to write and speak, and thus, if I am to communicate with you in words, I must 'give you a line,' and you must follow this string of letters. But, of course, the world itself isn't strung out; it exists in many dimensions. I have, then, a preference for books that I can open at any place and begin to read - books like a garden in which I can roam, and not like a tunnel, maze, or superhighway where I must enter at Point A and come out at Point Z."

The garden analogy is appropriate since such an ecosystem is characteristic of the CNR program. Many diverse and significant things evolved out that environment. It was through their interaction and integration that so much came to fruition. The process was nurtured from an array of inputs. Energy flowed as gateways were opened and pathways created for every possible activity and interest. Niches were designed to expand every opportunity. We built bridges and tore down walls. There was stimulation and awareness in the beginning and slowly we developed understanding as well.

> "The harmonious cooperation of all beings arose, Not from the orders of a superior authority external to themselves, But from the fact that they were all parts in a hierarchy of wholes forming a cosmic pattern and what they obeyed were the internal dictates of their own natures."
>
> Chung Tzu
> (Third Century)

"A map should be regarded as an antedote to panic."

From: "Mapping" by
Daniel Greenhood

There is an obvious absence of any charts, diagrams or graphs in this dissertation. This should not be construed as a rejection of the important role that data displays have in supporting any specific position, but their usefulness within the context of this particular approach is limited.

The development of the CNR program has provided materials and information appropriate for the understanding of the structural components of the program but lends little insight into the functional aspects.

The thesis has been divided into two separate parts to reflect the importance of both structure and function in understanding how an ecosystem behaves. Even though structure and function are inseparable aspects of any system, separation became necessary to provide some clarity in interpreting the complex character of the CNR ecosystem.

Part I provides descriptions of the functional aspects of an ecosystems approach. Chapter I illustrates the type of environmental (societal) issues and thought processes towards which the CNR program has focused its concern and activities. To understand why CNR did what it did, and the way that it was done, one must recognize the factors that motivated and directed the activities and the character of the program. Chapter II describes the efforts of an implementation process associated with the type of concern and perception of chapter one. These initial implementation attempts are preadaptive aspects for understanding how the implementation process actually used in CNR had evolved. Chapter two illustrates how identification and understanding of complex issues are necessary but insufficient criteria for effective implementation and change in society. The character of the operational environment must also be identified and understood for the design of viable ecosystems. Chapter III begins the description of the functional behavior of the CNR program. The context for the design process of the CNR ecosystem have been provided by chapter one and two. In Chapter IV certain concepts and processes are described as they emerged from the design of the CNR ecosystem and as these concepts and processes might be interpreted for use in the design of any ecosystem. Chapter V gleans some of the insights available from the experience and provides some possible directions for future inquiry.

Part II displays the structural aspects of the CNR program. Interpretation and evaluation of an ecosystems approach can be more effectively understood by testing one experience against another and one image against another. The structures of CNR are displayed to provide that comparison. The implementation aspects of the CNR program can be evaluated within the context of the appropriate structures.

The CNR program can best be described as an experimental, interdisciplinary, environmental educational program whose primary focus is the identification, understanding and resolution of complex and highly interrelated environmental issues taken in their societal context. The activities of the program are directed towards the design of effective, holistic and systemic methods appropriate to this comprehensive focus. Further insights into the character of the CNR program will emerge from travelling through this essay, but some intitial understanding can be gained from looking through Part II before proceeding in Part I.

The CNR program and the concept of an ecosystems approach have been the result of the interaction and the integration of many diverse ideas and individuals. Both the approach and the program are constantly being molded and modified based upon the inputs fed into them from the participants and processes within the program and from the additional pressures imposed from the environment surrounding the program. All of the faculty, staff, students and community participants have and will continue to play an important role in the continued evolution of an ecosystems approach and the CNR program, but the wisdom and foresight that created the framework essential for this evolutionary process has come primarily from Professor Arnold M. Schultz and Professor C. West Churchman. Arnold Schultz initiated the intellectual direction for the CNR program and provided the conceptual framework conducive to an effective and operational problem-solving environment. It is through his leadership and wisdom that the CNR program has had the capacity to develop in the manner that it has. From West Churchman comes the profound insight and clarity of how an holistic and systemic approach can be understood and utilized for the comprehension of complex societal problems. The implementation aspects associated with the CNR program are the consequence of their grasp of and interpretation of complex systems.

The existence of the program itself is sufficient justification for the use of the program as a model of how this approach can be used.

My concern stems from the perceived need on the part of society for a "conceptual map" with which to look at reality. It needs a method for learning how to think about complexity and how to mold our thought habits and patterns of thinking to deal more effectively with complicated problems. This thesis is in effect a compromise between the constraints of our present modes of thinking and the perceptions of reality that are appropriate to these issues. Since compromise necessitates operating at a lower level of efficiency than would otherwise be possible, there is a necessary modification from the ideal.

> "Everything flows and nothing abides; everything gives way and nothing stays fixed. You cannot step twice into the same river, for other waters are continously flowing on."
>
> Heraclitus.

This dissertation is not intended to be a guide for the future activities of the CNR program nor is it intended to provide all of the required aspects for the implementation of a similar program elsewhere. Evolution continues. It moves forward without regard to what is stated here. Neither have I stood still. Much of what took place within the context of CNR during the period 1969 to 1973 has been replaced by new ideas and perceptions. It has been difficult to reach into my memory and provide the honest (as best as I can recall it) insights into the events which took place. The process was so dynamic that accurate reflections are frequently closed to effective understanding. Events happened as they happened. I was particularly concerned that my *ex post* interpretations would be biased by my present level of understanding rather than by their significance at the time.

This essay is itself a reflection of how we cut up reality into pieces, how we organize our perceptions into concepts and then begin to rank these concepts into priorities. Problem-solving reflects only one aspect of a range of categories that constitute our thinking processes. Yet, it forms the central focus for this discussion of an ecosystems approach. Thus, reality itself forces reductionistic constraints on how we behave.

The ecosystems approach ranges far beyond a problem-solving format. In its broadest construction it encompasses the complete character of Nature, including all aspects of the human capabilities. Sherlock Holmes once said that "One's ideas must be as broad as Nature if they are to interpret Nature." But Nature is very complex. The degree of complexity involved varies from issue to issue, problem to problem, and is dependent upon both our observational framework and our capability to handle what we observe. These are not mutually exclusive phenomena.

Some things are difficult to understand not because they are complex, but rather, because they are confusing. We are unable to sort out and organize information because we are unaware of or unable to see what is happening in that particular system. Since the methods we have for identifying and understanding complexity are inefficient, we tend to <u>simplify</u> things to the point where we have some control over their behavior. We <u>ceteris peribus</u> everything. By holding certain factors constant we can then isolate the influence of a particular characteristic and observe its impact and effects. This approach is often useful for studying models of systems but is quite limiting as an effective method for resolving societal problems.

The concept of monoculture is a direct result of simplifying reality. By trying to eliminate [hold constant] any competing species, either plants or animals, and by attempting to structure the environment without regard for the totality of interactions, we improve our <u>short-run</u>

management capability to the sacrifice of long-run stability. Effective ecosystem control requires much more than an ability to manipulate specific elements of that system. The long-run implications and the total costs (not just economic costs) of this simplifying technique cannot be ascertained with methods which limit the factors to be studied. An example of this situation is the energy requirements that are needed to maintain these simplified ecosystems. To achieve the amount of output desired from these simplified systems, a great deal of energy has to be applied to "drive" them. In the U.S. we currently input (on the average) for agricultural crop production, nine calories of energy to obtain one calorie of usable energy. (Steinhart, p. 84) Of course, this kind of energy utilization is only possible, at present, because Nature has provided us with stored energy in the form of fossil fuels. Even though this aspect is of major consequence, there is another danger present which manifests itself through the directions in which these ecosystems are being modified. The focus of our attention should be on the long-run viability of ecosystems. It is certainly true that there exist many well-founded reasons for these techniques and many benefits accruing from them, but they are, at best, incomplete substitutes for the complex and often subtle interactions that characterize all ecosystems. As a beginning we should improve our management of ecosystems by providing a more comprehensive and integrated approach. Integrated Biological Control is such an attempt (Stern).

Our current methods create situations which require constant vigilance and modification just to prevent system deterioration. This process eventually becomes unavoidable as the natural processes are disrupted, the "new" system incorporates the "constant vigilance and modification" into its own process and, like a drug addict, can no longer get along without it. Eventually the system reaches the critical zone of irreversibility (Wantrup, Chap. 6; see also Detwyler, Shepard & Mckinley on long-run ecosystem viability).

In a liter of composted humus there are many hundreds of different species present and many thousands of individual living systems (organisms). This vast array of "things" can be identified and "listed" that is, classified in terms of their individual identity but we are totally incapable of describing their behavior, their relationship to each other, and their relationship to and role in their environment. This limited understanding illustrates the degree of our dilemma and the importance that must be placed on the role of natural processes in the maintenance and control of dynamic systems. It also indicates that we must understand the potential limits of a system when we substitute natural controls for artificial ones in designing effective mechanisms for the system.

Simplification leads to catastrophe. Reality is complex and thus should be dealt with in all of its complexity. The key then, is not to simplify but to make reality less confusing. What we need are thought processes that will ease our frustration in handling complex entities. It is only when our sense of balance is restored in the face of difficulties that we are able to "live" with our frustrations. The essence of an ecosystems approach is to provide that sense of balance, that feeling of recognition and identity with our environment. It is being in a state of at-ease rather than dis-ease.

The ecosystems approach is not a panacea for every condition; nor is it a "finished product" that can be bottled and sold. It is an evolving mosaic of perceptions and principles which can be selected from the array of potential insights into Nature. Nature can never be completely described. There is no ecosystem which can ever be completely described or understood. It is what we do not know that has to be integrated into our problem-solving methods, and not just what it is that we are aware of. Most of our model building gives us a sense of security about what we do know and that is inappropriate to the kinds of problems that we have to deal with today.

> "The wise man looks into space and does not regard the small as too little, nor the great as too big; for he knows that there is no limit to dimensions."
>
> Lao-tse

There are some formulations that can be used to aid in our comprehension of an ecosystems approach. There are also some criteria that will guide us in the development of this approach. This creation of a design process is the central focus of this dissertation, but in a form that provides insights and images rather than rules and procedures.

> "All scientific theory is an analogy." Jacob Bronowski

Weaving, as a process, takes on many forms and exists in almost every culture. There are certain conditions required for the creation of a woven article, no matter what its eventual purpose might be.

- A purpose is needed for weaving; be it a rug, hammock, some religious ceremony, a form of entertainment, etc. So it is with any human activity. We need a purpose or more directly a set of operational objectives. Some direction which can be acted upon. The purpose chosen is usually formulated through a range of inputs that are derived from cultural, psychological, or physical entities. They constrain the formulation and its selection.

- Weaving cannot be done without a framework, that is, some kind of loom. Frameworks take on a wide variety of different structures in different cultures and for different uses. They are made out of a wide variety of materials but they all serve the same essential purpose in that they aid in the act of weaving. They provide a means by which the weaving process can be facilitated and enhanced. These looms take on different characteristics depending upon their uses, but they all have the capacity to perform certain vital functions that are universal for the act of weaving. So it is with any decision-making process. We need "looms" or conceptual frameworks upon which to hang our ideas and perceptions, and to perform certain essential tasks. These frameworks "ease" the collection and organization of information and also clarify complexity for us. Without them we have difficulty in functioning effectively. We are frustrated.

- Resources are required for weaving. Materials used in weaving come from almost any conceivable source. Certain kinds of weaving require certain kinds of things to be woven and we must always be cognizant of the kinds of "materials" that are needed and available. In decision-making we are also in need of natural resources that take the form of physical entities as well as ideas.

- Certain techniques are required for integrating the material. Specific skills and tools have evolved that are essential to the weaving process. In resolving problems we also have need of specific techniques, but they must be useful within the context of our framework, resources, and purposes: Techniques that are both useful to an approach and a set of factors that will limit the array of problems that we can work on. The important element here is that these techniques must be available when they are needed. We need open access to them.

- A weaver can accomplish little without the use of a pattern. Sometimes these patterns are handed down from generation to generation, sometimes they are explicitly designed out of the perceptions and impressions of the weaver, and at other times they may evolve out of the weaving process itself, the materials or the purpose. They are all patterns. They are images that we obtain and capture in the same way with problem-solving. One should not begin (although most people do) without some comprehensive arrangement and interaction of all of these images. All aspects interact in an ordered array of actions: A plan.

- Experience is required if one intends to become a "good" weaver. Efficient and effective operation requires that all aspects be translated into a number of possible action intervals. In other terms, our learning becomes a reiterative process that should improve as we feed back information that directs our activities in the future. Some weavers have a "talent" for what they do and thus they tend to become quite proficient. Especially when the rewards are greater than the costs and provide reenforcement of their efforts. To accept and absorb these kinds of design criteria we also must have available some suitable reward structure. In some cases these "rewards" come in the form of an easing of frustration as we gain experience. Not just through accomplishment but also through the satisfaction of having participated in the process itself.

Some caution and economy is required in interpreting any analogy. However, this one serves a useful purpose by exposing certain behavioral patterns and processes which synergistically create an holistic paradigm. Regardless of the method used in designing an ecosystem approach, it must exhibit the characteristics given in the above analogy. The ecosystems approach "weaves" together many different "threads" to provide a cohesive picture of the issues, problems and strategies for effective understanding. The approach will still leave us some distance from complete understanding of what is happening but it does improve the search.

It is in the action and the events that some semblance of reality can be identified. The condition of reality is constrained by the writing.
How does one convey what really happened?
How can I make clear the interaction of forces and factors which brought about these unique events?

Nothing illustrates as well as experience.

"In times of danger, stay low and zig-zag."

Larry Janss

PART I

THE FUNCTIONAL ASPECTS OF AN ECOSYSTEMS APPROACH

CHAPTER I

THE FOCUS OF THE CNR PROGRAM IS IN THE ISSUES

Perspectives on a whole system:

There are many ways in which to talk about how we can look at whole systems. It is quite plausible for us to establish a set of rules which can then be used to guide us through a system and provide the framework in which to evaluate what we are observing. This method offers some advantages if, in fact, these rules are useful for observing any system. If they are able to be generalized then we would do well to assimilate them into our own problem-solving network. Unfortunately, these kinds of "rules" are not immediately recognizable as appropriate until we have established some justification for their existence. In this regard, it is helpful to "walk" through a system and get a "feel" for the way one might approach the identification and understanding of the behavior of a whole system.

In 1960 the Meador family left the Bay Area and moved to primitive land, eighty-five miles north of the Arctic Circle, in an isolated segment of the Alaskan Brooks Range. Their homesite was seventy trail miles from their nearest neighbors (a settlement of forty persons) and 250 miles from the nearest road. The family consisted of Fred, Elaine, and a three-year old son, Dion.

I have personally known the Meadors for some time. Initially, I became aware of them through the showing of their film, "A Day In The Sun" which was shown throughout the S.F. Bay Area. The film documented their life in the wilderness of the Brooks Range. After the film was shown there were lengthy discussions about their life and philosophy. Afterwards, I discovered that we had a mutual friend who owned the house that I now own and who also helped to make the film. Bill Fuller had spent considerable time in the Brooks Range and decided that he wanted to lead a lifestyle similar to that of the Meadors. Whenever the Meadors came to the S.F. Bay Area they stayed at Fuller's house. My interaction with the Meadors and Fullers is significant because it provided a multifaceted view of the Meador's life and their attitudes towards it.

As a consequence of these contacts and the kind of interaction which eventually developed, I was able to obtain the services of Fred for a small number of highly interactive seminars for the CNR program. In these discussions amongst small groups of people from the program, I learned a great deal about the Meador's lifestyle, values, problems and attitudes towards wilderness living. Fred also gave a lecture to our IDS 10 environmental course which had some 300 students in it at the time. One of the interesting characteristics of their public lectures and statements is that they would never discuss (to my knowledge) the kinds of issues that will be conveyed in this essay. During some of these short and more personal discussions Fred revealed many of the details that I am attempting to integrate into some comprehensive image of their situation.

Many of us felt that the Meadors were attempting to justify much of what they had done by allowing us only a limited entry into their world and thereby conveying those aspects which placed their experiences and themselves in the proper light, which is not at all unnatural. It is important to recognize that I have some personal envy for their efforts and I admire them for having the courage of their convictions. They have chosen a pathway which for them has proven fruitful. In fact, one of the major reasons that I have chosen this particular story is that there is much to learn from their experience and from their perceptions of the world. Insights can be gained from what they did as well as what they did not do.

Let us first look at some of the reasons for their decision to move to the Brooks Range. Fred had found that, in general, he couldn't stand people and people couldn't stand him. He was constantly hassled by everyone for his lifestyle and values and was justifiably reproachful of the way in which others formed judgments about him and his family. With this concern in mind, Fred and Elaine set out to discover some environment in which they could live with themselves and be at peace with others. Unfortunately, everywhere they went they encountered people who forced them to compromise their values and their lifestyle. They soon reached an impasse with the way they were living and the way they wanted to live. Eventually they chose to find a place to live where other people would not want to live, and more importantly, "a place where others would not want to come." This direction led them to a wide range of environments in the U.S., Canada and Mexico. The search was finally successful when they learned about the Brooks Range. This was the kind of environment for which they were looking.

The criteria they used to select this area are of interest as they display how one's mental framework and analytical filters will bias the kinds of questions that are asked when attempting to identify the "problem" and resolve it. In this case, the Meadors' first questions concerned the extent to which the area was isolated from other human beings. This corresponded to their interest in isolation. From an ecosystems viewpoint the first questions would also emerge from the fact that there are a lack of humans in the area, but this condition would evoke a series of questions pertaining to why no one was living there in the first place. Obviously, such an aesthetically pleasing environment with water, land, and food would be habitated by Eskimos were it not for some disadvantage. What then were the conditions of this particular ecosystem which kept it from being effectively exploited by the natives of the area? My concern would have arisen from the lack of people while in the Meador's case it was the absence of people that preconditioned their selection of the area.

Before their arrival in the Brooks Range they had spent some time in British Columbia in an attempt to acclimatize themselves and to obtain some of the necessary survival techniques. Much of what they learned from the Eskimos of Canada had real value to them in their new home. Yet, there were many aspects which were not as readily transferable from one ecosystem to another: Such items as the migration of the caribou and the techniques associated with fishing and hunting. Most of what they learned had to come from experience. Since they had a radio available to call outside in case of an emergency their mistakes would never be serious enough to threaten their lives. Things did not appear to have an irreversible character to them.

Upon arrival in the area they set out to build a cabin. Above the Arctic Circle ecosystems evolve very slowly compared to ecosystems in warmer climates. Changes occuring in these systems tend to have a "permanent" character to them in that they require a very long time to recover, if they recover at all. Trees with a diameter of six inches or more take a long time to grow to that size. It is hard to find trees that are both "good sized and straight" enough for the purpose intended. The Meadors had to cut the required trees for their cabin from a very extensive area surrounding the lake next to which their cabin was to be located. The impact of this kind of utilization can be quite severe. As long as the population in the area remains small and the need to acquire sufficient material is limited, then the ecosystem may have the time necessary to recover. The sustained yield concept is of value here, but just how is one to judge and estimate the factors that will provide such an insight. With neither the time nor the resources (including ideas) needed to derive this information one is forced into decisions based on the kind of sensitivity that one should have for natural processes and values; native people would have developed just such a sensitivity. Not necessarily through explicit recognition of the issue, but in an evolutionary manner that would correspond to their ability to survive over the long-run. The Meadors, for all their intentions, had no such historical precedence from which to evaluate their actions. Sensitivity is important but insufficient for effective action. One of the most significant aspects of their activity stemmed from the transformation process that they underwent from being placed in an alien environment.

After they arrived in the area they discovered that their three-year old son Dion was able to stand outside in twenty degree below zero weather for as long as three or four hours and watch the caribou eat. This kind of sensitivity is quite profound just by itself and is generally held attributable to the degree of openness in children of this age to the recognized lack of significant filters to what is happening around them. Also this openness can be attributed to the fact that Dion's mind had not been overly stimulated by a constant barage of images and activities, and was thus, in a very loose way, adapted to the degree of stimulation available from that ecosystem. Neither Fred nor Elaine had the capacity to "stand and watch the caribou eat." Fred's attitude was that, "if you have seen one caribou eat then you've seen them all." It actually took seven years of readjustment to their environment before they were able to establish the kind of rapport with this ecosystem that allowed them to feel comfortable. The lack of sensitivity to the prevailing conditions is important for understanding how problem-solving takes place. The design of any ecosystem must coincide with reality. It must be an evolving system because as we begin to change with greater awareness and understanding, so the designed system must adapt to these new realities. Flexibility is the key to effective adaptation. Fred and Elaine did not clearly recognize this phenomenon and they did not prepare for the problems that were created by this condition. As Fred has said:

> "The move from a materially affluent society to a wilderness is not simple or immediately rewarding."

There exists real isolation when you are deprived of friends, family, and community and also from the technological innovations that have provided you with the requirements for your existence that you must now obtain yourself. There are the internal problems that manifest themselves in your relations with others; a general lack of sensitivity that comes from close contact with others. We are frequently able to overcome problems, not by dealing with them directly, but rather, by avoiding the offending party until the impact wears off and the importance of the issue diminishes with time. That is, we deliberately refrain from confrontation and attempt to escape the frustration. In the type of environment chosen by the Meadors, this particular issue was not easily resolved. During the winter, confrontation is unavoidable. Consequently, they were forced to confront the situation and find a means to resolve their difficulty. Often certain factors emerge in a way that bounds the system for us. It pressures reaction by blocking escape.

They were also concerned with the impact of isolation from other children on their only child. They became foster parents in an attempt to alleviate what appeared to be a potential problem. Two other children were found to act as companions for Dion. One of the children was a Black girl named Linda Johnson. All went quite well and the children became close friends and then an emotional and trying experience occurred. According to Fred, the Black community in Alaska felt that Linda's isolation from other Blacks would seriously deter her formation of an appropriate cultural image. The concern was that the Meadors would be unable to provide an acceptable level of cultural development in the wilderness for her and she was taken away. While I have my own opinions on the issue, the incident itself is of some interest.

There is no away!

The Meadors have done little to "escape" the problems that they have tried so hard to get away from. The fact that we are all subject to the ecological relationships in our lives bears well for the need to have an effective process for identifying these complex factors.

> "In Alaska we eat only those foods that the land affords, although it took discipline to change our diets so completely."

They do not sow crops but they do slaughter animals. The difference, they believe, is in domestication. Crop sowing alters a natural land pattern; the animals they kill are indigenous to the land. Their diet is about eighty percent caribou meat, and includes most of the organs, some bones and most particularly the fat. For it is in the fat that they obtain the essential vitamins and minerals that replaces what they would otherwise obtain with a more diverse diet. The Eskimo necessarily evolved a nutritional system that establishes the conditions for survival within the constraints of a very limited set of resources. In ecological terms they are part of a very simple food chain (cycle). This chain consists primarily of a plant known as the caribou lichen and this plant forms the primary portion of the caribou's diet. Other elements in the cycle are the caribou and humans. Every ecological community has available to it a set of interrelated processes that form the structural framework that provides for a viable and stable system. It also evolves patterns of resource utilization that eventually makes the "best" use of the environment. The conscious recognition of these forces and patterns provides the essential criteria for understanding the behavior of complex ecosystems.

The caribou has a much more diverse diet during the summer months than in the winter. Still, the overall conditions force the caribou to rely heavily upon the lichen as a source of food. The lichen plant grows almost anywhere it can obtain a foothold. One of the unique properties of the lichen is its ability to assimilate nutrients from both the atmosphere and the soil. As a result of heavy atmospheric testing of atomic bombs, there occurred a sizable injection of radioactive debris into the stratosphere, where it will remain for long periods of time (Woodwell, p. 130). One of these particles is the radioisotope Cesium 137. This isotope has a half-life of about 30 years, which makes it very long lived. It behaves essentially like potassium, an essential element of all cells, and thus it becomes widely distributed once it enters the body. Consequently, it is passed along to meat-eating animals and under certain circumstances it can accumulate in a chain of carnivores. In a study done in Alaska, lichens were shown to have collected Cesium 137 from fallout in rain. It was found in high concentrations in caribou (about 15 micro-microcuries of cesium per gram of tissue in their bodies) and about twice that in the Eskimos tested. Wolves and foxes who ate caribou as a significant portion of their diet were found to have three times the concentration. Thus, it is easily seen that unless the substance is excreted or metabolized in some way the concentrations could reach high levels (Woodwell, p. 133).

Another aspect of the radioactive fallout situation stems from the Meadors' (as well as Eskimos') habit of eating pulverized bones of the caribou as well as cooking and sucking out the marrow of the bones. This creates a problem because another byproduct of nuclear fallout is the radioactive substance Strontium 90. This substance is similar to calcium in its chemical behavior and thus it tends to concentrate in bone. It is primarily a hazard because it can cause damage to the mechanisms involved in the manufacture of blood cells in the bone marrow, and may cause cancer. It is usually ingested through leafy vegetables and products such as dairy foods. It is not part of the food chain concentration since it lodges chiefly in bone, unless the predator eats bone (Woodwell, p. 132). With these conditions in mind one can easily see that the selection of an ecosystem whose food resources requires the adoption of a simplified diet will endanger the stability of one's own system. Problems become compounded.

It is not possible to "prove" that the Meadors have suffered directly from the type of diet that they have chosen. We are aware that the hazards involved cannot be treated lightly. The purpose here is to illustrate the kinds of situations which may develop as a direct consequence of a nonholistic and unsystemic insight into the behavior of an ecosystem. Fred has told me that he has broken his leg twice, once while taking off his boot. Dion has had some problems with bones, but Fred was unclear and reluctant to talk about it. I do know that one of the reasons for the making of the film was to provide the financial means to pay off some of these medical bills.

Even disregarding the potential problems associated with their radioactive intake, there are a number of other issues of interest.

With the heavy reliance on caribou meat as a source of food, the Meadors must obtain sufficient quantities to supply them with food throughout the winter. Also, in the spring there is a need to obtain sufficient food to last through the summer. The migration routes of the caribou take them through the area of Meador's homestead at a time close to rut. According to Fred, the meat will not preserve properly after rutting takes place because of chemical changes in the animals metabolism. The hunting situation becomes very tense at times when this period arrives. Often a tule type fog will descend, making location of the herds and killing very difficult. This risky condition may have been one of the primary reasons that the area was never inhabited by the Eskimos. Of course, with the use of a rifle by Fred, obtaining food has been improved over the traditional methods previously available to the Eskimos.

The only decisions that we ever really get to make are to chose the kinds of frustration that we wish to deal with next . . .

Reflections from the story:

What do we gain from looking at an ecosystem in this particular way? We should have some insight into an array of patterns and processes within a system. We should now be able to formulate questions that reflect the comprehensive and interrelated character of an ecosystem. The specific levels of resolution chosen should give us some points of reference through which our inquiry will have meaning.

Little has been said about the behavior of other aspects of the system and there was little need to discuss them unless my frame of reference were to change or my purposes altered. Their importance is not diminished by their absence. Nor is the validity of this one perspective reduced by their absence. It is not in the specifics that understanding takes place but in the conscious recognition that impacts are felt throughout the system and it is through an ecosystems approach that these effects can be most effectively exposed. Reflected in the process is the "feel" that one should have for the totality of our relationship with the environment.

Illustrations of Systemic Relationships:

An array of perceptions will aid in the identification of the processes that are characteristic of all systems.

- The banning of DDT has been shown to have had some validity in terms of certain specific impacts on ecosystems. The banning process was based upon the specific effects of this particular chemical rather than on the underlying factors (e.g., persistence, highly toxic, broad range, etc.). Upon banning of DDT other similar pesticides were substituted, some of which have even greater effects. This lack of systemic thinking causes one problem simply to be transfered to another.

- Our economic system is generally regarded as a throughput system in which materials flow through the system in a linear fashion rather than through such natural processes as biogeochemical cycles. Much effort is made to insure that there is an improvement in the amount and type of material that is recycled. In Richmond, Calif., a paper recycling plant (Westerncraft) was recently shut down because it was the largest polluter in the city. Even though the plant recycled large quantities of paper, the effluent from the plant contained large amounts of toxic chemicals that caused heavy pollution of the S.F. Bay. Here is a situation in which the concept that everything has to be some place (Commoner) was not adequately considered and is generally not evaluated when making decisions. One kind of problem is traded off for another.

- Southern California Edison has located many of their fossil fuel plants along the coast. This location provides a cheap source of cooling water to operate their plants. Thermal discharges create a year round temperature near the outlets of the plants which affords an environment for many fish species which would normally migrate into warmer waters to the South were it not for this warm water. With this ecosystem modification, the fish (e.g., albacore) are there year round (so far). Edison uses this to claim that thermal effluent is beneficial rather than harmful to <u>all</u> marine species. Edison has clearly failed to grasp the systemic factors involved. If migration by these species is normally triggered by temperature differences, then any interruption of this behavior will have some effect on the ecosystem. It will undoubtedly influence the predator-prey relationships, the reproductive process, the resistance to disease, and other factors not previously taken into account.

- The general effect of air conditioners is to transfer hot air from inside to the outside, from one kind of environment to another. As the outside temperature increases due to the large input of additional heat, the air conditioner has to work harder to maintain an effective cool temperature inside. This, in turn, causes the motor to give off more heat making the outside hotter. This process of positive feedback, of course, is a spiralling one which can potentially overload the system. The other significant aspect of this situation is that individuals who do not own an air conditioner (the poor) not only have to put up with the natural heat, but with the heat from everyone else's air conditioner as well.

<u>Honey Bees and Bears</u>:

Concern over the possible harmful effects of refined sugar and a corresponding increase in the price of sugar (for a number of reasons) resulted in the increased consumption of honey, both as a health food and as a substitute for sugar. This rise in the demand for honey has driven its price up substantially. At the same time there has been a large drop in the honey bee population caused directly by the use of pesticides and agricultural chemicals (Sierra Club personal communication). In fact, a twenty percent drop in numbers of American bee colonies in the past ten years is of concern because of the role that bees play as pollinators in the production of fruits, berries, and leguminous crops. Almond growers in California have had to import over 100,000 bee colonies from Montana and elsewhere. Annual honey production in the U.S. has dropped from 131 million pounds in 1973 to 100 million pounds in 1974 (The Christian Science Monitor, May 20, 1975). The problem is worldwide and is easily transmitted across political boundaries because of the current demand for honey. West Germany's apple crop was down forty-one percent and Burma has failed to produce any sunflower seeds for nearly two years (Audubon, Jan. 1975, p. 123). To insure the maintenance of an adequate and optimum supply of honey, an interim solution has been found. This "solution" to the current supply problem has been disclosed by beekeepers around Peace River, Alberta, Canada. They have slaughtered about 500 black bears to protect their investment in one of the largest honey producing centers in the world (Audubon, May, 1974, p. 109).

The demand for bees as pollinators has also created a serious problem of bee rustling and hive hijacking. Recommendations for "solving" this problem include suggestions for the branding of bee hives.

Problems are transmitted through the system because of the interrelationships that exist between them. Since "everything is related to everything else" it would appear obvious that some procedure must be established that conveys the total comprehension of these kinds of effects. Had some consideration been given to the predator-prey relationships and the food chain factors, the possible consequences could have been exposed in sufficent time to design a strategy to alleviate the major consequences.

Pardon me, but your water is going down:

The internalization of many of our problems has been suggested as a means to resolve many pollution problems. Internalization will often lead to a consistent pattern of perception that constrains the methods of problem resolution. The J. G. Boswell Co. in California is a large agricultural conglomerate which usually provides its stockholders with a visual display of its yearly operations. Of the many factors covered by the film, "The Big Land," one unique aspect stands out. This is the issue of maintaining enough water to carry out its production quotas. Water is a serious problem in areas where the type of crops used are not consistent with the natural ecosystem patterns. Irrigation is at its highest technological level. Because of the character of water development and its delivery systems, and with the existing laws governing the acquisition of water, there is a continuous demand for extremely large quantities of water. This "need" can only be effectively satisfied by the extensive use of ground water supplies as a supplement to the amounts supplied through irrigation systems (Seckler, California Water). The Boswell firm expressed its concern over the rising costs required to obtain adequate supplies for its use. The statement is made that some years ago when the firm first began to extract ground water they had to go down only a short distance to obtain water but that each year they have to drill even deeper to obtain an adequate supply. The actual distances are of little interest in relation to the underlying implications of what is happening in that ecosystem. There was little concern (I observed none) for what was happening to the water table and the long-run consequences for their own area if the process were to continue. There seemed to be little concern what this would do to the whole system. While they are big and rich enough to afford the investment of continuous development of water, there were many others (small farmers) that are really paying the price of this kind of exploitation. Since ground water tables extend over large regions, they form the rationale for decision-making and policy formulation well beyond the normal boundaries of the firm. There are a great many ecological as well as economic and social implications for this situation and only a comprehensive understanding will create the kind of rationale that will catalyze the political action necessary to ameliorate the condition.

- For a wide variety of reasons, water pollution in S.F. Bay is extensive. There are many aspects to the impacts created by this pollution. Many of them obviously relate to the ecological viability of the area. A particularly significant effect relates to the protein and recreational loss to the poor. Fishing tends to provide a dietary supplement that cheaply increases the protein intake of the poor. The Bay also acts as a recreational resource in the same way. Pollution reduces the potential use of the Bay for these purposes. As this resource is reduced then additional income must be spent to maintain the same protein intake as before or a loss is incurred. Substitutes for recreational needs must also be found or done without. Limited budgets force losses, in general, rather than a reallocation. This kind of systemic rationale is usually left out of any pollution abatement consideration.

- We currently register approximately 240,000 new chemicals each year in the U.S., and it is estimated that:

  "Every 20 seconds a new and potentially toxic
  chemical is introducted into industry."
  (Public Health Service Pamphlet, HEW)

  The relative impact of these chemicals on any ecosystem will never be determined. The interaction of these chemicals with each other - the synergistic effects - form an infinite series. We know that when we have two substances that act together they often have a greater effect than the sum of their separate effects. The number of tests required (not to mention the costs and the energy requirements) prevent any real <u>ex ante</u> recognition of their effects. We are continually relying, with faith, on ecosystemic processes for the maintenance of ecosystem viability.

Our ability to develop a sense of the critical zones of irreversibility is limited (Ciracy-Wantrup). It is not the actual condition that is relevant but the potential for disaster that must be considered.

Some comments on story-telling:

In telling these stories the major purpose has been to provide a vehicle for discussing the concepts and principles applicable for comprehending whole systems. A wide variety of aspects have been deleted from the discussion since they were unnecessary to the central theme of perception development. This should not be construed as an evaluation of the importance that these aspects might have on the resolution of some identified issue, but rather, the simple fact that this essay does not lend itself to the development of a comprehensive perception of just one situation. My primary concern is that someone reading these scenarios and recognizing the obvious limitations will draw erroneous conclusions about the process. In reality there is nothing lacking in the process itself, but there is something lacking in the procedure chosen to illustrate it. The trade-offs involved placed me on the horns of a dilemma. On the one hand I could have developed the kind of holistic and systemic perception of a single issue that would have effectively conveyed the character of the approach and then generalized the significant principles. I decided to provide a series of trips through an array of situations so that the "feel" of this way of thinking could be obtained.

The question is not always, "who gains and who loses?" but what processes are affected by that action and how will these changes alter their behavior. It is only after this situation is identified that the total implications can be ascertained.

There is a strong set of factors which must be recognized to understand the importance of maintaining the viability of any living thing. Aside from the aesthetic and emotional implications (which are both important and considerable) there is the need to maintain gene pools as evolutionary storage banks of information. Gene pools provide a reasonable insurance (there are many other benefits as well) against the loss of information that has become available after eons of testing. These genes would not, of course, be available unless they had some significance in ecosystems. The fact that they exist at all should be of sufficient interest to provide the rationale for their preservation. Even though species are eliminated in Nature through many different causes, it would be erroneous to conclude that the artificial or inadvertant elimination of species can be predicted to have deliberate benefits. In an evolutionary sense species which eliminate others through competition do so because they have developed or are developing characteristics that have significance for the system over those presently occupying that niche. There is an underlying rationale of some significance for "natural" selection, but no such assurance can be made for the kind of intervention the thrust of which comes from entirely different motives. Species do not exist in isolation from one another. There are interactions between species and between a species and its environment. They are part of a food web. To assume that endangered species can be protected or preserved in isolation from the interactions which determine their own viability is erroneous. That is why there is no such thing as an endangered species; there are only endangered ecosystems. Of course, the primary reason for talking about endangered species in the first place is that people would not be able to identify well with the concept of an endangered ecosystem. It has to be a recognizable living thing. This idea can be confirmed by the fact that you never hear about an endangered bacterium or an endangered microorganism. Such endangered species do exist. How about an endangered weed? The role that these species play in an ecosystem can be as vital and as significant in terms of their potential impact on an ecosystem as any higher organism. We are dealing with a set of values in people that is indicative of their inability to fully comprehend the systemic character of things and how things are interrelated. Whole systems seem to have little relevance in the lives of most people, and our actions and attitudes reflect this condition. Even though we have recently passed legislation (on paper) to protect the polar bear, we have failed to provide the protection necessary to preserve it. Its survival is precarious because its ecosystem is precarious.

The processes that provide for both viability and stability are similar to ecosystems found anywhere. Ecosystems of human design and construction have historically had a variability in their behavior that has limited our ability to grasp any consistent patterns for the maintenance of stability and viability. The identification and understanding of these systemic processes and the interactive patterns that they create, provide the criteria for evaluating our actions. They are the keys to our survival. The directions toward which our problem-solving should go is given by the extent to which we are able to ascertain the kinds of impacts and the degree of change that can be anticipated in complex systems. We have to have correspondence of the natural ecosystem functions and our actions. This approach should minimize the potential for irreversibility.

The use of analogy is very much like looking at a picture on a wall. We are able to distinguish the artwork clearly from the wall because there is a boundary which separates them. They do not merge because the picture has been framed. It has not been set apart from its environment since that continues to influence how we perceive the picture and also how we interprete what we perceive. There is a total impression conveyed to us based upon the patterns that have been designed into this system. Our interpretation is, in part, determined by the character of the room, its size and color as well as such factors as the lighting. These conditions, in total, aid in the creation of a mind set that conditions us for the images that we expect to encounter. All of these factors together guide our analytical processes and focus our attention in preconceived ways. The influence of the environment on our conception and understanding becomes very significant. One of the important aspects of systems thinking is the ability to discriminate among many factors and place them in a context that reflects their relevance and reduces the formation of erroneous relationships.

We find in Nature many processes that maintain life forces. These forces, cycles, and relationships also depend on each other to maintain their own viability. Because of this interdependence one thing cannot happen without some effect being transmitted to other areas of the system. The general law holds that everything is related to everything else and that you can never do just one thing. In this way we can no longer depend on the acquisition of sufficient knowledge to insure that we are making the right decisions. To assure ourselves that one particular method or action is the appropriate one, we must have confidence that once the action is initiated, there will be a continuation of the force or process carried out in an appropriate way. That is, we do not want to be evaluating the activity at every step in its progress. If the mind had to be told where to sequentially search next for information we would never find anything in memory. There has to be a process that programs the events. Successful systems control requires that we identify and understand these behavioral patterns and processes so that implementation strategies can be properly selected.

If I am able to identify and, more importantly, generalize the behavior of any system, then I should be able to identify how some action in a similar system will be affected. If the objective is to design an urban garden, then it must be clearly understood how it is that that garden should behave. If there are no resource limitations, then my options are greatly expanded. This expansion of opportunity will seriously modify the management models that can be devised. There is no real sense of what specific behavioral pattern is needed. I am dealing with infinites. What guides me in my decisions? How do I control the variables that are presented to me? I will certainly want to establish some method for decision-making that gives me the "best" chance of controlling this complex situation. Do I need a set of constraints to bring the array of options into some manageable network? Do I need some criteria for establishing their importance and priority ranking for implementation?

EVERYTHING MATTERS - EVERYTHING IS OF CONCERN

When we want to look at how a system behaves or how it functions, we will not want to exclude any factors which may have some influence or effect on the system. To select an appropriate strategy for resolving an issue we require correct identification of the situation in question. This is one of the reasons why one would not want to establish a disciplinary base for the comprehension of complex and highly interrelated problems. Any time a disciplinary approach is used to resolve an issue then the only solutions proposed tend to come from that same discipline. If I were an economist then I would evaluate the information and data that is available on the basis of the theoretical and methodological concepts from the field of economics. This filtering technique would provide a model of the problem composed of components and relationships characteristic of the economic aspects of the problem. It would only be logical, from the point of view of the model, for me to select or develop a solution that is economic in character. I not only would be unable to provide another type of solution (e.g., biological) because of its inability to fit the model, but also because of my background and training I would be prevented from recognizing the kind and degree of appropriateness of any other approach.

CHAPTER TWO

UNDERSTANDING OF THE ISSUES IS AN INSUFFICIENT CRITERION FOR IMPLEMENTATION

"Wholeness may be thought of as a kind of inner equilibrium, in which all our capacities have been brought into functioning as an organism. The potencies of the whole organism flow into the gestures of any part. And the sensation in any part reverberates throughout the soul. The unconscious and conscious levels of being can work together at the tasks of life, conveying messages to each other, assimilating one another. In wholeness I sense an integration of those characteristics which are uniquely ME and those interests which I share with the rest of mankind."

M. C. Richards

History as Conditioning:

Sometime in the early part of 1968 I was involved in a research seminar concerned with natural resource utilization in developing economics. As a graduate student in the Agricultural Economics department at U. C. Berkeley, I was frequently at a loss to find sufficient advice for my particular focus as it was not a major component of the departmental orientation. To establish some characterization of a developing country I attempted to ascertain the interdependence associated with some specific issues. A reasonable assertion could be made for relating the need to expand and develop the natural resource base of a country in association with increased demand for food. I began an intensive analysis of the potential for aquaculture as a means to satisfy both the required food demands and as a potential source of exportable protein. Since much of the land of developing countries had a marginal level of productive potential, it would seen prudent to establish a development base that was consistent with the natural resources of the area. I discovered, and not unexpectantly, that very little effort had been invested in establishing just what the character of the resource base (including values) was for any particular region. This lack of comprehensive understanding usually created an erroneous impression about the adaptability of any projected innovation, whether this innovation be technical or technological in character. As my research into the broad aspects of the potential for aquacultural development proceeded, I soon learned that the degree of interaction between the theory and the reality of this kind of effort left much to be desired.

In Chile there has been a very serious protein deficiency outside of the major city areas. This shortage has created some serious health problems for the people of the area. The price of most meat is at a level that keeps it out of the reach of the vast majority of citizens. Since Chile is a coastal country there is a good supply of fish nearby which could become a major source of the needed protein. With such a plentiful supply of fish it would seem that it would be utilized in the diets of the people to a large degree. Fish consumption rarely occurs except near the coast. Part of the reason that fish has never been of any real significance in the interior is the lack of refrigeration or other methods of fish preservation. There had never been any real attempt to alter the eating habits of the people and thus little was known about what it would take to accomplish this objective. The government of Chile decided that the most appropriate way to do this would be to establish a consistent and competent method of supply. A government subsidy was provided to bring the price of fish substantially below the cost of any other protein source. There were also many other supplemental incentives to induce change, such as providing recipes oriented around traditional dishes. The distribution consisted of a truck "train" of portable units. One unit at a time would be dropped off in various local markets throughout the region. Each unit would have fresh, iced fish displayed aesthetically. One would believe that all significant aspects of this marketing situation had been effectively identified and integrated into the planning and operation of the effort. Predictions of the Chilean government indicated that this comprehensive program would meet with great success. Unfortunately, the people did not buy the fish, nor did they attempt to modify their habits. Something was obviously lacking in the analysis (Dr. Fernando Rodriquez-Schuller, personal communication).

What exactly was missing from this approach and why was the failure so substantial? One of the major reasons for such a failure stems from the kind of approach used to ascertain the appropriate variables. The people who would be the primary "beneficiaries" had not had sufficient input into the planning process, either directly as participants or indirectly in terms of the values through which they evaluated and made their decisions. It is really fortuitous when planners working from outside of the system are able to ascertain the relationships that characterize the behavior of that system. The boundaries have to be sufficiently permiable to allow considerable information to flow across them.

As I began to question the methods used in the development of effective programs I realized that most of my insights were sufficiently biased by the educational process alone (there are many other biasing processes), so that I felt that a realistic appraisal of the comprehensive character of both the problem and the environment within which it had to be resolved was not possible inside of a disciplinary paradigm.

In the area of aquaculture an adequate and cheap supply of food may be insufficient reason to insure its acceptance and its implementation. The tremendous effort put into the development of such miracle foods as triticale has generally been met with similar rejection.

In a project originally done by a group of Peruvian researchers and community developers along with a group from Cornell University in the 1950's one of the best efforts that I know of was made to overcome this problem of acceptance and change with a strong respect for the cultural, social and ecological components of a situation. In Viscos, Peru, there was an agrarian reform project which involved the modification of an existing agricultural, social and economic system. The elements of the transformation from a feudal land system into a viable private property and market economic system are not of concern here (The objectives could be debated quite easily). The significant aspect of their approach was in the way in which they developed access to the system. These communities are dominated by both mistrust and scepticism of strangers. Many previous attempts had been made to alter the patterns of agricultural production, but with little success. The rigidity of the culture was very strong. The development team accomplished the restructuring of the landownership, the economy, and the educational and political framework with what appeared to be minimum disruption of the culture. The key factor was really not one single event, but the method utilized can be illustrated by one example. There had to be a preadaptive process set in motion to overcome the reluctance to change. The people in this community had previously been obligated to the patron for certain tasks. One of the most hated of these obligations concerned the use of the ranch meadows by sheep and goat herders. The location of the village was in the high mountain areas and animal herders would come down in the winter to use the lower meadows and then would return to the upper meadows in the spring. Certain "fees" had to be charged for the use of the lands. Since someone was "assigned" the job of fee collection in the fall, during harvest, and then again someone else in the spring, during planting, there was considerable distaste and resentment for this task. It was the specific insight into the operational behavior of the people and their society that provided the keys for unlocking the gamut of interactions that made effective change possible. The "sensitivity" as well as the desire to incorporate that understanding into their problem-solving methods, allow future processes to be established and then to be continued.

The research team resolved the issue of the "fee collector" by finding one of the villagers who was unmarried and without land making him permanent "fee collector" from which he derived his income. The sense of "trust" and understanding pervaded the image that the people of the village had of these outsiders.

The images arising out of these kinds of situations had a pronounced effect on my attitude towards development. Similar examples also became a significant aspect of my continuing belief that some kind of course or seminar was required that would provide the kind of comprehensive perceptions that these complex issues required for effective understanding.

I began to feel a strong need for some type of framework for looking at societal problems within the context of their environment. The disciplinary methodologies to which I had been exposed failed to provide the desired synthesis. I had very little feeling for what was necessary. It seemed that the simple addition of "more" and "better" knowledge would really do the trick. If I understood more about what was going on; then, it would be quite easy to adjust the character of the research to include this relevant information. It was simply the idea than an additive approach would benefit everyone concerned. There seemed to be no real need to modify the methodology involved. Was it not true that a demand curve was derived out of the totality of interaction of the physical, social, psychological and cultural factors that caused people to demand what they did? Surely the problem was based on the fact that people just did not have the "right" kinds of information to incorporate into their framework? Whenever significant points were made relative to the issue of development and change in an economic situation, justifications and rationalizations could always be made for problems arising out of the solutions proposed. People seemed to recognize the limitations of these methods but there was never sufficient impact to justify the alteration of the techniques. It was only when I began to read articles in ecology that some real comprehension began to emerge. I became aware of an entirely new way of searching for the proper questions. It was in this context of awareness of considerable information outside of my own field, but vital to its effective interpretation, that I became motivated to attempt the establishment of some kind of course or seminars which would provide the insights into this condition.

My first attempt began in the fall of 1968 in the Department of Agricultural Economics where I was a graduate student. I approached the Chairman of the department and he listened very intently to the idea and then politely informed me that it was certainly a very interesting idea but that this department could not teach such a subject. He also indicated that he was unaware of anyone on the Berkeley campus who had such interests or would be capable of structuring such a course. My persistence in explanation forced him to say that my outlook was just a mite idealistic. As I began to restructure my arguments (a technique for which I am well known), he hurriedly suggested that I talk to the Dean of the College of Agricultural Sciences. I do not believe that the Chairman thought that I would really pursue the idea any further since later he was greatly surprised when informed that I had gone to see the Dean.

The Dean was also very considerate and listened with interest to my proposal. He conveyed his personal concern for the issues that I had raised, but what I was proposing was not appropriate to the College and there were no funds to start such a project. He indicated that he was aware of the kinds of interdisciplinary efforts that frequently crop up on the campus but that they never had much longevity. After some comments about the disciplinary character of the campus he suggested that he had heard that the Dean of Letters & Sciences was currently interested in establishing some kind of course like this, but he was not sure. I arranged an appointment with the Dean of L & S and we talked for about ten minutes. The conversation was very abrupt and the idea met with some concern (and what appeared to be scepticism), but obvious disapproval. After some discussion of the apparent limitations of the university in the pursuit of knowledge and their commitment to search for better understanding of the ways of the world, I was directed towards both the deans of the Colleges of Engineering and of Environmental Design. The meetings were as expected. There was now some concern for my sanity as well. Somewhere along the line the Board of Educational Development was suggested as a possible sponsor. I never did pursue this avenue, but I do recall feeling that a non-traditional approach would eliminate the kinds of participation on the part of faculty that I considered necessary. This was most definitely not the kind of response that I had envisioned. It was much more of a psychological setback than an intellectual one.

Upon my return to the portals of Ag. Econ., I decided to take matters into my own hands and I began to organize some interest in arranging a seminar series around an interdisciplinary environmental framework. Speakers were invited and announcements given, but the effort met with something less than overwhelming approval and acceptance. Around eight students attended the first seminar, but no faculty. It was then that I was called into the Chairman's office for a little chat.

He reminded me that I held an NSF traineeship and that as such I was expected to devote full-time to my obligations as a graduate student in the department. I informed him that this was an integral aspect of my interest and an appropriate part of how one should look at developmental issues. Without comment on that statement I was informed that my purpose for coming to the university was to gain knowledge about the methods of pursuing these interests and that it would be in my best interests to first obtain a thorough grounding in these tried and true techniques before embarking on some experimental approach that had little historical validity.

I was now at a stage where I had some insights into the operation of a university and, more importantly, I was now able to recognize that an idea of some possible merit would often go unrecognized because of the method and form of its presentation. The fact that an idea itself may not be given consideration was a significant factor in my comprehension of the implementation criteria.

At this time I became interested in establishing some framework for identifying the behavior of the institution which I felt would provide me with guidelines for integrating my ideas into a format easily understandable and, thus, defensible from the point of view of those who would ultimately be making the decisions about it. I attempted to enter into discussions with both faculty and students in the department to aid me in identifying these factors, but I again met with opposition. The thrust of the arguments focused around the need for objectivity in science. "We are only able to observe and analyze; we are not suppose to try to tell people what to do. We are only able to describe what _is_ happening, not what _ought_ to happen." My point that we don't really know what is happening, was just overlooked. I don't give up easily, but now I was discouraged.

For some time there had been a developing concern for the survival of the College of Agricultural Sciences and especially the Dept. of Ag. Econ. This concern stemmed from the continuing decline in both graduate and undergraduate enrollments and also with the numbers of students enrolled in courses. The School of Forestry and Conservation had shown continued growth in their majors, but little increase in course enrollment. It was becoming quite obvious that unless some dramatic change was made in the faculty/student ratios there would have to be a shift of the departments of the College to other campuses. Panic began to set in. Within this climate of fear some real motivation began to appear to redirect the focus of the departments and to update the courses that were offered. This situation is very important because it provided the environment for change. Previous to this condition there existed an extremely defensive posture on the part of faculty for any kind of modification in the existing program. On numerous occasions students had expressed their dissatisfaction with the way things were going and the inability to draw new students and good faculty into the departments. The stage was set for change and the possible acceptance of new ideas.

My specific efforts to establish an interdisciplinary course on environmental issues were well known within my department, but news of them had not been widely disseminated throughout the college. I had had many discussions with one of the faculty members in the Dept. of Ag. Econ., who had been high up in the administrative structure of the university. He was knowledgeable about the political process and offered some strategies for implementing ideas within a university structure. I had been naive about the nuances of personal interaction amongst faculty. I had failed to comprehend the subtle factors of the interaction between people and the kind of images that are created by the manner and character of what was being discussed or proposed. Effective implementation requires a strong sense of the internal behavior of any system. My introduction into the histories of specific attempts and successes at changing the university and, most importantly, the College and School had a pronounced effect on the way in which I perceived my role in this operation and the "sense" of my participation. The almost unbelievable (at first) political, psychological, and social aspects of how an institution behaves in its "search for knowledge" cannot be underestimated. They play the dominant roles in any implementation strategy. The details of these exchanges become rather boring to relate, but suffice it to say that I became sufficiently informed to recognize my lack of education concerning the complexity and the character of making change in society. How do you learn where the impact of an idea will do the most good?

Inadvertantly I learned that there was to be a new (Acting) Dean of the College. I went to his office to discuss my proposal and the possibility of creating this interdisciplinary environmental kind of course. He expressed a strong interest in my idea and indicated that he also had had some thoughts on the subject. He was particularly interested in what I thought a course like this should be about. Having once been burned, I was twice cautious, and restrained my desire to tell him how it should be done (a notable achievement). He indicated that he would like to talk to me some more about this when he was in a position to do something about it. My impression was that I was being given the runaround again and that the idea had little, if any, chance of ever getting to first base. I was still trying to persevere in the Dept. of Ag. Econ. (a task becoming more dubious by the moment) and I had arranged to bring some people oriented around environmental issues into the department to discuss these issues and also to try to provide some motivation for promoting the concept of an interdisciplinary course on the subject. There was some concern on the part of the faculty (two) and students in the Natural Resources segment of the department, but they almost unanimously felt that this concern did not warrant a special course on the subject. The general feeling was that any recognition or expression of the importance of environmental problems were, at best, premature, but in all likelihood just another fad which would have little impact on the world, not to mention their own research. Nothing was done to alter this attitude.

The department chairman called me in again to purge my continued efforts in this area. I was informed that this effort was not in the best interests of the department. They had been trying to prevent any serious modification of their current research interests and there was a campus wide effort to "water down" these research objectives. If I persisted I would not be allowed to keep my NSF traineeship. I was reminded that I had received this fellowship with certain stipulations and that I had obviously "branched out" from this orientation. I was now a very frustrated individual. I decided that I should pursue my interest outside of the university since it was hopeless within it. My interests began to focus explicitly in the direction of environmental issues and around environmental organizations. I then became involved with "grassroots" types of organizations concerned with environmental issues.

One of these organizations was the Berkeley Ecology Center. Among the many factors involved in the creation, development and operation of the Berkeley Ecology Center, one of the more significant elements relates to the tremendous change in my own outlook and motivation as a result of finding the kind of mutual support that reinforced my decision to move in this direction. Being part of a "community" of interest helped to overcome the harassment and intimidation that had prevailed. I had just begun my intimate involvement with the Center when I was called back into the office of the department chairman of Ag. Econ. again. It then became my intention to resign as a graduate student and leave school. As I went into the office my mind was made up. An entirely different attitude greeted my arrival. He asked if I was still interested in that course on the environment and I said that I was even more interested than before. He indicated that he had had discussions with the Acting Dean of the College and that they had discussed my interest and that the Dean would like to talk to me again. The Acting Dean and I discussed a variety of aspects about the character of such a course and the implications for the college and the fact that there were now a large number of faculty interested in pursuing this effort. Our conversation focused on what, how, and who about the course and the kind of student interest that might be generated. He then asked if I would be interested in aiding in its development and teaching in it. I indicated that I was very interested, but that I did not think that my department would have the same concern as I. He said he would speak to the department chairman about it.

Some days later I was called into the chairman's office. He said that he understood my interest and concern, but that I had other obligations which would take precedence. My anger was obvious. I indicated that nothing could be further from the truth and that my education was dependent upon my continued involvement in areas where these kinds of insight would and could be exposed. He said that I should consider the full implications of what I was doing, but that he doubted that I would be able to involve myself in the development of the course since they intended to require a Master's degree of those who would be involved in the teaching. Since I had not passed my written exams, I did not have a Master's degree. When we discussed the request that the Acting Dean had made he indicated that a number of faculty had been discussing my situation and they all felt that I had not been applying myself as diligently as I should, and this would probably be reflected in my written exams if I did not direct my energies into more productive channels.

All of these factors combined to create a very difficult situation for me in terms of my life and the goals with which I had for so long been identified. These personal problems manifested themselves in the desire to leave Berkeley and my family for awhile to sort out the directions I should follow. Another student and I went to an Environmental Quality course at Oregon State for six weeks. The seminar itself was not very valuable since it had little in common with our concerns. However, the time spent away from the environment that we had been so close to was of great value to me. It brought perspective to the issues involved and to the way in which they had to be evaluated.

Upon my return I became directly involved in the Berkeley Ecology Center and spent much of my time in organizing, developing and working on environmental issues. The involvement with others who were also concerned and motivated became an instrumental aspect of my interests and the direction of my life. I had always reflected a broad-based perspective of the world, but my training and the opportunities had never given me the chance to express that philosophy in any productive way. As I worked on these diverse issues and problems I began to visualize the concept of facilitative implementation. I became aware of the numerous ideas and potential approaches to problem-solving that usually go unrecognized and untried. As people came into the Ecology Center they wanted to do something about some problem, but knew nothing about how to go about doing it. For some, those who had the motivation and intensity to try anything, this was not a real problem. These people would just plunge into something and pursue their interest in an _ad hoc_ manner. This type of involvement became invaluable in terms of their own learning process, but did little to resolve the issues that were the real concern. There was no foundation upon which to build any real understanding of how to identify the "problem" or how to go about resolving it. Many of the proposed "solutions" were worse than the "problems" they were designed to alleviate.

The principal developers of the Center oriented the operations through a philosophy calling for well-defined structures that provided clear identification of responsibilities and roles for all of its members. This structured approach seemed to be very non-productive. It embodies a philosophy that everything and every relationship was known, _ex ante_, about the entire system. A fantastic flow chart was devised to display the roles and relationships between every possible entity within the Center. Every avenue of interaction and every potential pathway for information was determined. No one, according to this approach, would ever be confused as to what and how their contribution to the organization would be handled and integrated into the system. It was a fiasco. It was a case of the traditional planner and designer trying to establish the criteria and requirements to achieve a certain kind and degree of behavior. Every detail is determined and everything that could be of import is included; nothing seems to be overlooked. Why is it that these types of approaches never seem to work except in very limited situations? The answer seemed to center around the objective of achievement over process. The desire to "achieve" something excludes the "process" involved to reach that level of achievement. Dynamics are involved in what is happening in natural systems. They are evolutionary in character and cannot afford to make such structured decisions about the future. Whenever any species evolves without some built-in flexibility to adapt to changing conditions its survival is seriously jeopardized. What was needed, but never was created, was a dynamic and interactive network of pathways that would provide the flexibility required for an evolving process.

Some preconditioning is necessary before any real perception can be obtained for designing an effective set of processes. I had to become aware of my own biases and values before I could recognize the usefulness of any others. It is possible to look at something only with the eyes that you have and to look at something in a different way requires a total retraining of the eyes. A magician uses this phenomena very well. If I want to fool you into believing something is happening, then I must be aware of what ways you normally behave when exposed to certain types of information. My judiciously creating a situation that conveys a specific arrangement of information, then I am able to provide an illusion of reality while simultaneously modifying what is really happening. Modification takes the character of both form and content. We all experience this condition. We are faced with the same information, but we filter it through lenses that have been manufactured from past information. Only if observational techniques have general interpretive qualities can they be useful over a broad range of experiences. There is a general insecurity which develops when we attempt to incorporate new ideas and information into our present framework. Institutions are not designed to reflect this condition. They fail to respond to the fear which results from risking intellectual identity and this forces people back into the traditional paradigms.

With this interpretive attitude I began to establish an understanding of what was going on in the Ecology Center and to understand <u>why</u> it was happening. Identification with the behavior of a system provides insights into what processes allow for effective interaction. This behavioral understanding also aids in recognizing the capabilities that are available and the needs that frame the objectives of the group.

There were many problems about the organizational framework. Some of these stemmed from the type of highly structured model previously discussed. The well-defined approach had met with such opposition that it set the stage for a consistent refusal to accept or design any other approach. If the idea smacked of structure it was rejected out of hand. The group had been pre-conditioned. Everyone was so concerned with allowing complete freedom to be pursued that they failed to comprehend any need for cooperation (except in a very limited way), or the need to coordinate energies for more concerted actions. There was a failure to communicate and to provide sufficient feed-back for effective modification of effort. The result was a very energy depleting system. It is ironic considering that we all recognized that the lack of coordination and cooperation in our society was responsible for most of the environmental problems that we were trying to resolve.

All activity proceeded outward like a supernova. It was psychologically exhausting. The turnover rate of people was enormous. From one day to the next there was a flux in the membership and the activity. There was an obvious need in the community for the type of effort that the Center was potentially capable of fulfilling, but the processes required to meet these needs was unavailable. There was an inability to adjust to changing information. A real learning process was absent. Even when effective information was being received it was seldom able to be integrated into the current procedures and way of thinking. It was only through the turnover phenomenon that change took place. These new ideas coming in would act as both a catharsis and a catalyst for energy resurgence. Actions were modified through attrition and absorption of outside energy. The maintenance of the Center was determined by large inputs of outside energy. As long as new blood and new enthusiasm could be captured by the group then its validity as well as its viability could be kept intact.

It would be wrong for me to imply that the Center failed to respond to the obvious problems that would appear on the surface. They did respond readily to what appeared to be needed. The implications of what I am trying to convey is that they failed to grasp the significance of the continued conditions that appeared: the underlying causes. There was an unrecognized cancer in the body causing a headache. They responded to the headache with aspirin which only resulted in their delaying the response required of the true problem and compounding its effects. Responding to symptoms rather than causes made the problem that much more difficult to deal with when it was eventually exposed. I might add that this type of response is a condition that pervades most of our problem-solving in society today, so it should not cause any startling revelations to occur. There was no conceptual framework available which would "force" people to look deeper into the issues. Those people working in the Center responded in a linear, cause and effect manner that rarely leads to long-lasting and productive resolution.

It also should not be inferred from this set of perceptions that the Ecology Center was totally ineffective or non-productive within the limited areas in which it operated. For the time and resources that were available to it, it was very effective for certain types of activity. It was also a fertile environment for exploring and innovating ideas and actions which would not have occurred otherwise. The purpose here is not to create either an historical or comprehensive description of the events that transpired during my involvement with the Center. The importance for this dissertation is the pre-conditioning and preadaptive processes that prepared me for my efforts in CNR. Many of the ideas which I had held while attempting to establish an interdisciplinary environmental course were found wanting when they were put into practice. I had never been more aware of the divergence between theory and practice. Somehow we continually fail to adjust our teaching methods to the need to reconcile what we learn with how it is used. Much of the philosophical rationale for the concept of the Ecology Center was well thought out. There was a strong recognition that traditional methods for resolving environmental problems would not suffice. The recognition that new techniques were required did not transcend the administrative structure of the organization.

Where the Center failed was in its inability to design an organizational structure which paralleled its philosophy. The lack of any real comprehension of the appropriate <u>kind</u> of structure is no real excuse. What should have been done? A structure could have been developed which explicitly recognized this set of unknowns and then flexibly designed to adapt to the changing conditions and learning processes inherent in any evolving system. There existed little or no network for feedback so that the sense of adjustment that may have occurred could not be effectively integrated into the ongoing procedures. As with any species, when the environmental conditions were altered and the ability to adjust was lacking, the system began to lose viability.

Another element emerged that also contributed to the Center's instability. Many of the people involved felt that the purpose of the Center should be focused on the creation of a place where energies and activities would be given the opportunity to develop, where people would come to work on projects and to avail themselves of the resources. Some of the participants wanted an orientation that would "draw" people inward like a magnet. One of the first projects was to widen the doorway because of the crush of people who would be trying to get inside the Center.

Others felt that the Center should have a diversity of activities but that much of the energy should be directed "outward" towards the community. This "outward" orientation stemmed from the belief that most of those who would come by the Center would be those already concerned and motivated towards environmental issues and that the real effort should be towards those who had yet to develop such a value system.

The conflict over the operational objectives of the Center was never resolved, not that it should have been, but there was never any real forum through which to display the issues in a manner that would aid in its resolution or comprehension. Dissention and dissatisfaction ensued. Confusion of this kind can often be diminished, if not eliminated, through the creation of effective environments for useful confrontation of the factors involved. Also, this ecosystems design approach would enhance what appeared to be a major difficulty in the condition and that is the perceived notion, in this case a true notion, that the people involved had little or no influence on the direction the organization would take. An assumption was made that since everyone was in general agreement with the overall purposes of the group, then they would not need to be involved in the determination of how this endeavor would be carried out.

The Center deteriorated into the more traditional approaches for running an organization. The group opted for a structure that would initially require a limited amount of very scarce energy in the short-run but would, and did, eventually require a much larger amount of energy in the long-run. The long-run energy exploitation cost the group its vitality and its health which turned out to be a much higher cost than had been anticipated and more than it could afford.

It is not unexpected that the criteria selected to operate the Berkeley Ecology Center were those that we find throughout most of society. That's where we all came from, so we simply reflected those perceptions. The Center still exists in a limited form. It has modified its original purposes and found an orientation that keeps it viable. There is nothing wrong with that.

CHAPTER III

AN ECOSYSTEM IS DESIGNED

"Let us say that substance is vibrancy tending towards transformation. All existence - whether mountain, sky, star, shaft of sunlight, thought, song, or self - is vibrancy. And the oak tree (if only I had eyes to see) is a particular arrangement of vibrant energy. The oak tree (if only I had ears to hear) is a consummation of its constituent vibrations, thus a perfectly harmonious strain of music. The oak tree (if only I had ways to learn) is available for me to enter and experience fully."

George Leonard

Comments on a pre-adaptive process:

It becomes very difficult to extract from an experience those facets that lend credence and comprehension to what actually happened. In reflecting on events in our past we often select those situations and conditions which stand out in our minds. Frequently, these elements are dramatic, but not always significant. I'm personally a believer in the philosophy that any factor may be a significant one and to downplay small and subtle aspects of a situation shows a lack of insight into how systems behave. In this particular case I am positive that the conditions present at the time of the event were much more complex than I am able to illustrate here. My emotions are an integral part of the interpretations of what went on. These emotions should never nullify the illustration simply because they bias my perceptions. Indeed, because they formed an integral aspect of my actions and my evaluation, they play an important role in fully comprehending what took place. They also aid in identifying my psychological condition and my frame of mind.

Much of what I learned about implementation emerged from the experiences in attempting to initiate an interdisciplinary course and my involvement with the Berkeley Ecology Center. Through the efforts with the course I obtained some of the most powerful insights. At the time that I attempted to establish this course, I had available to me many of the structured attitudes that predominate within the usual scientific modes of learning. It was just not sufficient to have a good idea: I had to develop and organize the information in a manner that would convey and justify my hypothesis in isolation from most of the factors relevant to its implementation. I had to "think through" what I felt was an important idea and to provide a plausible framework within which I could defend what I was proposing. It seemed to be appropriate for me to formulate my idea into a plan that would stand the "test" and that would show that what I was suggesting was certainly not a haphazard and half-baked idea.

This reasoning resulted in my developing a proposal that when presented to others left little room for modification or the incorporation of other values. That is why it was so overwhelmingly rejected. There are many other reasons as well (e.g., graduate student, Ag. Econ., demeanor, dress, beard, prejudice of others, etc.), but the character of my proposal seems to be dominant. One has to be somewhat concerned when _no one_ seems to understand or want your idea. My attitude, in the beginning, was that everyone was an incompetent and that absolutely no plan or proposal would have given rise to some acceptance on their part. This was certainly not the case, although I still think there is merit to the argument at times. I also do not wish to argue the case for their competency; but, that their possible incompetency is of little relevancy to this point. What I did come to believe is that I handled the issue very badly. To have assumed that I would be able to design an interdisciplinary course with all of its rationale, all by myself, was complete folly. If it was anticipated that other people and other disciplines would participate in its operations, then it would seem prudent, at the very least, to include the ideas and values of others in its design. This integrating insight was a revelation for me. It appears that much of the reason for the many failures of interdisciplinary programs and courses stems from the lack of a viable means to create this integrating kind of process. In the initial stages of its development any interdisciplinary effort must contain sufficient flexibility to evolve with the changing array of inputs and insights into the group. Any attempt to establish a plan without a parallel and explicit effort to incorporate the ideas and explanations from those who will be making the decisions as well as those who will be effected by it will rarely be successful.

The failure to reach some positive conclusions concerning my initial effort was largely the result of my failure to understand the coupling processes that would make the action viable. None of the people with whom I talked were able to identify with what I was proposing. Their own perception of the world prevented them from recognizing the implications of this specific proposal. In their world the assumptions that formed the basis for my actions just did not exist. Even my perceptions had just recently emerged from a long transition process itself and I would not have understood my own proposal just a few short months before. The process that I had gone through, and which had brought me to the level of understanding that I was presently in, had not occurred to them. They were unable to figure out how it was that I could think the way I did. From this insight came the realization that little, of anything, can be accomplished without some pre-adaptive mechanisms which can provide a conceptual framework for recognizing and accepting new information or reorganizing old information.

Each individual has developed habits that provide emotional (intellectual, etc.) security in a world that reenforces insecurity. These habits support whatever we believe and make change and modification difficult to accomplish. This rather obvious statement has to be recognized and made an integral aspect of any type of planning process if effective change is to be made and the transition to the new condition is to be less traumatic. Operational capability depends on our cognizance of these security factors and their influence on others.

At the Berkeley Ecology Center I had approached the subject of organizing and administering groups to people in the more traditional ways. There were hierarchically arranged decision-making units that transmitted operational criteria downward through the system. Efforts to provide inputs from below were generally peripheral in nature. They were really means by which some token inputs would be used as a way to mollify the non-participants (Lords and serfs). It was, and is, generally felt that certain groups have the capacity to affect decisions, and the others, even those with capacity, will better use their energies at levels of operation that "maximize" the output (however defined) of the organization. Within the context of entities that have goals that are also more traditionally defined (e.g., profits, market share, etc.) these techniques may be effective or relatively easier to control than the riskier and obviously less understood methods that pervade the structures similar to the Ecology Center.

The types of formulation chosen will usually emerge from the decision-making perceptions and actions of our past. The operational processes of the system in question have rarely provided the impetus for determining the character of our ideas and strategies for implementation. Our basic assumptions will usually remain intact and this "forces" the acceptance of those "traditional" techniques that have always been most familiar to us.

My original attitude within the Center was focused on these traditional procedures. I learned the uncertainty of providing a detailed and highly structured program to a group and then having them accept it, only to find out that the administrative structure prevented its implementation. Assuming that the techniques for implementation were adequate, I failed to grasp the importance that the environment within which a program would operate is as important as the content of the program itself. What was needed was an administrative structure and operational framework that would coincide with the actual working environment (system). It is this environment and not just the system components that make the thing work. Both the environment and the system are integrated into each other and neither dominates the other. It is in this integration context and the interfaces between them that the implementation issue resides.

There is another way of illustrating this concept: if one has all of the parts of a watch, one can never say to what degree any part is more important than another. Each has a role to play and is essential for the proper operation of the watch. Now if I wish to redefine what I mean by <u>watch</u>, then I might be able to modify the claim of equality for certain elements of the watch. That is, if I were to state that keeping time was not of importance for a watch, then some elements would not have the same value as the others since those specific parts had played a minor role in the operation of the watch. Their importance has diminished relative to the other parts. As long as the concept of the watch remains the same, then I am obligated to consider the importance of all elements within that context. Without a case in which to put the parts, I have satisfied the original perception of what it is that makes a watch, but I have failed to provide the environment that will allow it to consistently behave in that manner. The dynamic properties of the watch are lost. If I fail to design or create an environment appropriate to those aspects that will influence the overall operation of the watch, and allow it to function in a manner consistent with its design; then, I negate both its function and its usefulness. Thus, in ecosystems design both the comprehension of component interaction and the goal context are required. Remembering always that the environment facilitates both the operation and the interaction.

A wide array of diverse methods are available to adapt this design concept. Within the context of the Berkeley Ecology Center many of the members felt the need for a more operational environment, but also felt a cautious respect for assigning a limited amount of energy into an unclear objective. Just what do you mean by environment? It is hard to estimate the change that may have occurred if an ecosystems approach had been attempted. But such an approach was not attempted. What did happen was that the people became psychologically exhausted and frustrated by the inability to operate in an effective manner and over any length of time. The structure was too hierarchical, and unresponsive to the needs of the group.

Coherence in Systems:

Ecosystems are evolving systems. Because of their dynamics, efforts to explain their behavior have been difficult at best. Generally explanations result in the freezing of history, the constraining of the moment to moment interactions which provide a view of their patterns of behavior.

We all know how difficult communication is and how the nuances of language convey meanings that are unintended and frequently misinterpreted by others. This confusion becomes a major problem for an interdisciplinary effort because every discipline has its own interpretive paradigm.

I have found that analogy and example provide a means to splice perceptions together to form coherent entities.

There is also a much more serious problem that often causes failure in interdisciplinary efforts. This is the question of originality. Most interdisciplinary work is particularly vulnerable to this kind of criticism. Successful applications of an interdisciplinary effort result in a synthesis of information and the emergence of new and insightful ideas and approaches concerning the situation at hand. Ideas are not created in isolation, it is true; but, interdisciplinary efforts must confront the issue directly. Nothing that I do or have done could ever be done by me alone. Every achievement was an intimate and integral part of the interactions of all those involved in the CNR program and by some people who never knew that they were involved. It is absolutely within the nature of interdisciplinary, systemic, holistic and me. It is embodied in an ecosystems approach. All that is unique here is my perception of it.

The CNR Program is an innovative program designed for students who are concerned about the quality of the total environment. The program places maximum emphasis on individualized courses and experiences designed by the student to suit his/her own area of interest and needs. The flexibility of the program and its requirements allows students and faculty to adapt and adopt information, methods and formats in evolving towards a wide variety of purposes, goals and desires.

The character of the CNR program attempts to provide an environment within which students, faculty, and staff can work effectively together to identify and understand the interactions and behavior among resources, institutions and all species. No single academic program (including this one) can offer the knowledge and insights necessary to manage, understand or cope with the ever-developing environmental problems and situations. In order to attempt to understand specific problems or obtain specific training, students are encouraged to avail themselves of any and as many of the offerings both on and off the campus. CNR strives to provide a dynamic forum where the relationships among the involved academic disciplines and the community can be explored and integrated as the basis for informed action. It is designed for those students who are willing to take the major responsibility for designing their own education. It places a premium on learning by doing, studying in the field or working on community problems.

CNR is much more than a traditional academic program. It is characterized by a spirit of working together; through the creation of an innovative, interesting and relevant learning experience. It is an operational community. The full involvement of students in course and program planning and administration is encouraged and constitutes a basic part of the CNR program. Courses are continually being developed and reorganized in order to reflect the dynamics of reality, the learning needs of the students and the developing perspectives of the faculty. (For additional insights into the philosophy of CNR, see Part II)

"You must play the ball from where the monkey drops it."

From the rules of the Bombay India Golf Club

The Situation as Given:

The CNR program was in a state of enjoyable chaos during the Spring of 1970. The "flagship" course (IDS10) had been running (successfully) for two quarters and the CNR major had just started in the

Winter Quarter. There was little money, little space, little structure, little organization, little curriculum and some very big ideas and goals. We were also lacking any comprehensive approach to problem-solving although we had a very excellent conceptual framework from which to work. The concept of the ecosystem had been expanded from its strict ecological base into a comprehensive framework for the understanding of complexity. The lack of any well-defined set of conditions for the operation of CNR is certainly not a negative one. It was, to say the least, a fortuitous circumstance since it allowed for the evolution of the program within a wide range of possible directions. Few ideas could be excluded a priori. In order to exclude any potential idea a deliberate effort had to be made since there had never been any formal structure or criteria that would provide the means for evaluation or comparison.

Each situation or development had to be decided on its own merits. As certain methods were tried and as they often failed to provide an acceptable framework for evaluation then it was rejected. This flexibility was essential to the kind of success that we developed. Much of this credit goes to the students who were willing to live within this intellectual fuzzy zone. But most of the credit should go to a group of faculty who relinquished their fears to the potential that this new approach might offer. They demonstrated that rare gift of being able to break out of their own paradigm and redirect their efforts towards a new and untested one. There are no words to express the difficulty of this action or the immense implications of their contributions.

"They created feelings that I had never had before - an overwhelming sense of gratitude and appreciation - I love these people - they make life have meaning."

Many of the initial faculty members had some interest and concern for environmental issues and interdisciplinary education, but that was not their primary focus. The rationale from which the program was created came initially out of a concern for the declining enrollments within the College of Agricultural Sciences and the need to increase the course enrollment in the School of Forestry and Conservation. The CNR major evolved out of the recognition that a realignment of the undergraduate curriculum would enhance the image of the two sponsoring groups. It was developed to enhance and reenforce their desire to remain on the campus. A lack of faculty support for the CNR program was continuously and dramatically portrayed through a number of instances in which faculty demonstrated their disapproval of what was happening as well as their unwillingness to participate in any aspect of the program.

I had been working full time for the Berkeley Ecology Center during the early part of 1970. Because of my disappointment with the operation of the Center, I had been searching for new avenues to expand and develop my environmental interests. In March of 1970 I was called by David Seckler, the professor in charge of IDS10, and asked if I was still sufficiently interested in the program to come back and teach in IDS10. It was an opportunity that I could not pass up and I accepted.

My involvement and commitment was both immediate and extensive. I became emmersed in the life of the program. This was a very happy time. To the others in the program my motivation, commitment, and capabilities were sufficiently recognized to justify the faculty and students offering me the position of coordinator. In the past the rule had been that of "Head Associate" for IDS10, but the duties required that position to be expanded to include Coordinator for the whole CNR program. We still had a Chairman of the Administrative Committee who provided guidance and legitimacy to the operations of CNR. The Coordinator's position was necessary because it was the only "full-time" commitment available to the program at that time. When I became Coordinator, a majority of the faculty in the School and College were unwilling to participate in any way in the program. It was a slow and cautious process that eventually reversed this trend and began to bring these people and others into active participation.

"When you have a lemon - make lemonade.":

The situation as given in CNR when I became Coordinator provided the opportunity to utilize a very innovative approach. Based upon my previous experience, I was certain that I was not going to make the same mistakes again. No longer would there be the formulation of a well-defined plan of action and the creation of objectives in isolation from the corresponding community of participants. There would be no restriction of possible avenues and modification pathways for change as new information became known. To enchance what the program was capable of doing best, that is, providing maximum flexibility and experimentation, there was a need to provide the environment that would reenforce that direction. Since many faculty who were unwilling to participate except through some token way - and "coercion" in the usual FTE sense was not possible - then, some other technique had to be devised. My approach was to create an environment that was stimulating and conducive to learning; but one that would explicitly provide the means through which sceptical faculty could participate productively and on their own terms. The central theme of this approach and a principle which had guided many of my actions is that:

"NATURE NEVER <u>SET</u> <u>OUT</u> TO MAKE A SPECIES. EACH SPECIES <u>EVOLVED</u> OUT OF <u>AN</u> ENVIRONMENT THAT WAS CONDUCIVE FOR ITS DEVELOPMENT - AND NONE OF THE SPECIES ARE FINISHED YET."

This was the attitude that guided my actions and oriented the direction of the program.

<u>Find a niche and fill it</u>:

In any human designed evolutionary system there is a two-fold problem. One element is the identification of available niches and the understanding of what is required to satisfy the relationships that provide the criteria for niche utilization. The other aspect is the creation of niches which are suitable for the kinds of environmental relationships that are available. Some understanding of the systemic perturbations is required as realignment of elements occurring due to the creation of a new niche. In one sense it is necessary to search out these available niches and, on the other hand, it becomes necessary to create them. This orientation is adaptive to a facilitative process. This establishes the direction towards which the process must proceed. In the context of the CNR program this process directed and guided the activities to where they would be of value to the students and thus create the kinds of environments where existing relationships could be more effectively utilized. There was never any attempt to cut off any energies displayed, but we would attempt to expose the situation in the context of what each person felt were the important variables for that issue. This exposure would provide a means to place the issue in an holistic context that would provide and establish an explicit array of relationships relevant to the students own conception of the idea. From this framework we would then be able to adapt from the "real" situation and then guide the energy that had emerged. There are many philosophies (e.g., marital arts) that use this approach of never trying to stop the energy being directed, but instead to judiciously interrupt the vector and redirect the energy in a less destructive manner. This is the operational mode. Participants always knew that they would never be turned away and that their ideas would not be judged as naive or stupid. They began to adopt innovative and insightful ideas in their search for knowledge and understanding. They were not afraid to explore new perceptions and question the underlying assumptions of their interests and values. They began to learn.

Administrative Insights:

Many images of the administrative aspects of the CNR program have been placed in Part II to limit their interference with the stream of process within the dissertation. These structural factors and components evolved out of the conditions and arrangements existing within and about the University of California at Berkeley during that particular time. The best that can be hoped for is some identification and comprehension of the character of the program and some insights into the procedures and processes that made it happen as it did. The significance of this effort may be in the recognition that the kinds of behavioral patterns represented in the CNR program can be created from the implementation strategies developed here.

The program is a complex array of people, environments, events and processes. During my tenure as coordinator we were involved with the acquisition, utilization, exploitation and motivation of over 500 faculty members from 65 different departments of the University of California, Berkeley campus. These were people that had some direct contact with students in the program in some form. Many other people have participated in the CNR program and the best estimate is well over 300 business, government and other organizations, groups and individuals. Some of these people had only a peripheral contact, but a significant portion had, and continue to have, a close involvement with the courses and the students (See Part II for a listing of most of these people).

There are many reasons why we felt that this kind of diverse involvement with the students was so essential to the effective operation of the program. As we became more aware of the comprehensive character of environmental and social situations, we began to realize that "you can never do just one thing." The implications of any action cannot be fully understood, much less identified, without some comprehensive perception of the relationships between things. Relationships cannot be recognized if the eyes are only focused on one thing at a time. We must be able to direct our attention to an array of observations without losing sight of the initial issue. This formulation provides the rationale for our continued effort to obtain as wide a perspective as possible and to provide an educational framework that would "reeducate" participants. The change that was desired was in their conceptual attitude towards this kind of thinking. An interesting phenomenon was to what extent students and faculty alike began to realign their values as this process evolved. Not everyone did, but a significant number reflected these changes in their actions and the questions they asked. There was a definite attempt to alter people's values. The faculty and staff did not intend to alter them in any preconceived way or towards some specific goals, but to provide them with the kind of information that would give them the opportunity to expand their images. Each species attempts to exploit its environment within the context of its capabilities. It would seem that each person should be given the opportunity to discover what those capabilities really are.

Without a conceptual framework to help evaluate information that we receive, it does little good to go about collecting information. It is also very much like GIGO (garbage in - garbage out). We are all aware that the kind of data collected, the processing of the data, and the output are all reflected through the process. People, of course, are much the same way. If our programing is wrong, then it makes little difference how much and what kind of information is provided. The specific elements and structural components of the CNR program lend little insight into the approach. Thus, the focus of the dissertation is on the behavioral patterns from which the processes in an ecosystems approach will emerge.

Interdepartmental Studies (IDS) 10, "Man and His Environment: Crisis and Conflicts," (an ethnocentric title recently revised) formed the initial direction for the program. We also initiated IDS 49 (Introduction to the CNR major) and IDS 149 (Senior Seminar in CNR) as required courses. These three courses formed the operational framework within which the program attempted to provide some common thread of understanding and some foundation for the major. These basic formats alone were insufficient to establish any real educational process that would benefit the student when resolving complex environmental issues.

The dilemma became one in which some kind of structure would eventually lead to an established methodology and another discipline. Since we had no clear idea (at least there was never any real consensus) of what the real character of environmental problems were or any understanding of how to resolve them, we felt that the program must have the flexibility to adapt to new ideas and information as it became known. This was a constant battle because there was always those few who did have "the answer." Any kind of disciplinary structure would be disasterous from this viewpoint. A structured type of environment had to be avoided, but just how to do it in a way that would allow everyone, faculty and students alike, to feel comfortable with flexibility was something that had yet to be discovered. There was a well-developed realization that we had to allow experimentation and the testing of ideas, methodologies and techniques if we had any hope of obtaining the kinds of resources that we needed to establish ourselves as a viable educational program.

My particular formulation evolved out of this network of perceptions which, in part, were historical and were also based on the simple fact that I was at a loss to suggest any kind of reasonable alternative to the ideas that were being proposed. This recognition that there did not exist any "one" way, became a perception of consequence since it provided a rationale which reduced the influence of those who felt that they indeed did have the appropriate methodology for the program. Those in the program who felt that a particular direction should be chosen were deterred from any dominance in CNR. Yet, simultaneously, these same ideas were encouraged as an integral part of the program. Any faculty or student who offered an idea or suggestion was explicitly encouraged to pursue that direction. By deliberately listening to what others were saying, and extracting what appeared to be the key elements of their ideas, exploiting that perception as a positive force, the ideas exposed could be acted upon. Whatever the concept or whatever the idea, we made sure that it was never, ever swept under the rug, but effectively directed and implemented. My primary role was that of facilitator: to make things happen. I was a catalyst within the system rather than a controller over the system. I was also a friend. All of the faculty who were intimately involved with the program had a similar orientation.

> "And with listening too, it seems to me, it is not the ear that hears, it is not the physical organ that performs the act of inner receptivity. It is the total person who hears. Sometimes the skin seems to be the best listener, as it prickles and thrills, say to a sound or a silence; or the fantasy, the imagination; how it bursts into inner pictures as it listens and then responds by pressing its language, its forms, into the listening clay. To be open to what we hear, to be open in what we say . . ."
>
> M. C. Richards

An Ecosystems Approach is Formed:

It is in the design and establishment of environments that an ecosystems approach is formed. There is no one ecosystems approach. Since the major purpose of utilizing such an approach is to aid in the identification, understanding and resolution of complex situations, then it is understandable why no single technique will suffice to accomplish such an array of diverse ends. There do exist some criteria and procedures for the development of an ecosystems approach. The criteria and the procedures cannot be established through the use of traditional methods and statements which catalog components of the process as a linear series of events. The approach never acts as a linear series of decisions. No sequential ordering of significant factors will suffice to provide comprehension. Reality is complex and so must be our approach to resolving issues that are real. The criteria emerge from the perceptions obtained and then aid in our being able to ask the "right" kinds of questions. In this regard, the approach concentrates on the establishment of a process for dealing with complexity rather than an achievement oriented approach. It is of little interest whether ends justify the means or vice-versa. But whether it is in the process that comprehension takes place. Conscious recognition of the implications involved determine the character of the operational objectives. Ends and means become a part of the total decision-making process and cannot be separated from each other. That is, within certain types of environment only certain actions are appropriate. If I intend to accomplish certain tasks, then it is in my interest to comprehend the kinds of process that are there so that I may trace the consequences of any action through the system and thus make some determination as to the capacity to achieve the desired objectives within that context.

An ecosystems approach will not portray reality in total. It gives a conceptual framework within which certain relationships and behavioral patterns can be recognized. It frames a pathway to deal with complexity. An ecosystems approach is a way to organize our observations of reality. An ecosystems approach is an ordered perception of nature. An ecosystems approach is a process within which we may represent events that can be agreed upon.

Environments are designed:

Environments are designed to fit certain functions. If there is an interest in establishing some perception of a situation and to understand its structure, then this orientation will have a direct bearing on the kind of environment that would be needed to operate and function effectively. A setting must be created in which I and/or others will feel some benefit or gratification from participating in it. I must somehow feel comfortable or non-threatened. The value systems that I hold will have a definite influence on how I react within the context of certain settings. If I become pressured to act in a manner alien to my perceived roles, then I will respond in a way that reflects this kind of constraint or pressure.

No one should be able to manipulate your emotions or behavior unless you want that to happen. It is within our fears and insecurities that we formulate rules and patterns of behavior that guide our actions through forms that reinstill some semblance of psychological balance. Our energies are diverted to channels that we feel will provide the most benefit. This is why learning environments must allow our energies to be used for learning and not to erect barriers for our psychological defenses.

In the CNR program designing effective learning environments became a significant aspect of our operation. Faculty and students as well as other participants would come into our environment (e.g., physical, social, etc.) and adjust their behavior in a way that reflected the perception and image that was created. The room environment of tables, chairs, pictures, etc. had an immediate effect on people's senses that "preadapted" them for future interactions. The roles that they would play and the "faces" that they would display were influenced in this way. In the social context of the environment, my actions and the actions and attitudes of everyone else would provide a strong sense of how each individual would respond. Certain physical images created a condition which "set up" certain defense mechanisms or kindled certain positive actions within people that would guide their observations and thought processes.

Unless modification occurred to realign what would appear to be misconstrued notions of what was happening in this particular context, then the future direction of their perceived information would be "biased". The direction of their behavior would require either reenforcement or dimunition as the condition was interpreted.

The system within which I operated had to have the flexibility to adapt to differing images and adopt different methods as a consequence of the diversity of influences that were felt. The real effort, of course, had to come within the intersection of these influences and the physical, social, and psychological factors that emerged from the environment. It was essential that a sensitivity towards others and a resourcefulness in adapting differing techniques be available to satisfy this process.

Environments can be designed to adapt to a wide range of purposes. If the primary focus is on identification or understanding or implémentation of objectives, issues, situations and other organizational arrays of information, then the operational environment may be modified to suit those circumstances. Within the kind of environment considered, there is also the need to integrate into the design criteria the recognition of the type of people that are involved. This reflects on the improbability of establishing an array of information for this environmental design problem since there is no one particular set of factors which can be found to have universal influence on any and all environments. Each one must be designed within the conditions presented.

> " . . . behavior settings have as many richly interconnected elements that their tremendous complexity at the sensory surfaces of all inhabitants concurrently cannot, at the present time, be dealt with conceptually or practically. Behavior settings are often very large systems, and simplification is necessary. But what may appear to be the most obvious simplification, namely, dealing with the input to single inhabitants, or to a sample of inhabitants, does not reveal behavioral settings. It is not only in perception that the attributes of parts differ from those of the whole. In any system with interdependent parts the order obtaining at a point of the system varies with the portion of the total system within which the part is considered. It is easy to overlook how greatly attributes vary with context." (Barker, pp. 29-30)

Every effort to portray the reality of an event leads to simplification of the events themselves. This does little disservice if the simplification process leaves the reader with some insight into the actual situation. But it does a great disservice if in portraying what happened the perception gained invokes a modification in behavior that eventually leads to disaster. That is, the selection of factors that would provide an incorrect and insufficent process that creates a worse situation than the one being resolved. Creating an effective environment for the resolution of complex issues requires much more than a simplistic slice of reality. The nuances of interaction in a social setting are only understood within the context of the time-space continuum. They are dynamic and evolving systems whose boundaries, if known, are flexible, and if not flexible are generally permiable. This means that they can be adapted to situations that present themselves when the parameters become known. The direct and most important way in which they can happen is to design according to appropriate system processes rather than predetermined system states. It is through the character of the relationships between things that one begins to discern methods for modifying structure or developing mechanisms for behavioral "control."

In CNR it was one of my roles to act as a catalyst to explore and expose those factors that might form the primary boundaries for such systems and to devise structures that would reflect their importance.

The framework in which I tried to operate came directly from the interpretations that could be made of how these environments were established in nature (reality). It became necessary to find some way to compare and contrast our behavior with another holistic situation to make some determination of their value.

> "Altogether, then, there is abundant evidence that behavior settings, like many bio-physical entities, are strongly self-regulated systems which regulate the behavior episodes within them as molecules regulate atoms, as organs regulate cells, and as structures regulate the beams of which they are constructed. To the extent that this is true, it means that the ecological environment of behavior is not passive, is not directionless, is not chaotic or probalistic." (Barker, p. 29)

By utilizing process rather than structural components as the basis for our efforts, we were able to select environments which were self-regulating. Processes for behavior that eliminated the need to establish well-defined rules and guidelines that would provide control over behavior were rejected in favor of requirements that brought information to bear in a manner that was self-regulating. Attempts to establish educational structures that are normally found in disciplines were rejected because they limited the kinds of search appropriate to our purposes. If we already knew what the problems were (true problems) then we might be justified in establishing a direction and approach that would "educate" individuals to "solve" just these issues. Even if we had some comprehension of the character of the issues, we were very aware that our current methodologies failed to provide for effective resolution. This openness was self-regulating because it could be modified as our understanding improved. It did change as we learned. The need to allow for exploration that was non-traditional and risky was rationalized, but to what sacrifice for the faculty and students involved? Simply to allow freedom to pursue any direction would not suffice. Many of these efforts had already been pursued elsewhere and with little success. Our approach must reflect both our overall objectives and an understanding of the past.

> "Indeed, purely negative reform leads rather reliably to failure and disillusionment. The assumption behind negative reform goes like this There are bad, repressive things in traditional school, things such as exams, grades, group instruction, fixed seating and the like. All we really have to do is remove the bad things and then ecstatic education will flourist. But this is obviously and demonstrably untrue. Such things as exams and grades, no matter how oppressive, inefficient and antithetical to learning, do provide the glue and bailing wire that holds the old structure together. To remove them, it is necessary to put something in their place. Any attempt to create an environment with no reinforcement system at all can only lead to the growth of a hidden reinforcement system, dangerous because unacknowledged and unexamined." (Leonard, p. 221)

Other environmental programs were (and are) faced with the same situation. Their inability to transcend the known implications of an innovative approach often lead to the adoption of either of two courses of action. The most usual route was the double major which forced the student to identify a methodology and then supplement that orientation with some environmental insights.

The second approach was usually the establishment of a new discipline. This would then create a new kind of environmental specialist who would be capable of performing a specific service, such as a "water pollution control technician." We felt that this kind of approach should be left to the existing disciplines. A "water pollution control technician" could easily come from the disciplines of Sanitary Engineering or Chemical Engineering (and indeed they do). Our role appeared to be one of supplying (as educational jargon would put it) what could not be done within the confines of existing disciplines. We had to search for an approach which would in our minds, satisfy the need for identifying and understanding the real causes of the "problems" rather than efforts to deal with the basic symptoms.

There is certainly a need to attack those areas of concern in which the problems are well defined and identified and the techniques for resolving them are available, but there is an even more urgent need to find significantly new ways to perceive what the "real" problems are and to utilize information that is already available in a much more efficient manner. No one seemed to be taking stock. No one seemed to be searching for new approaches. No one seemed to be trying to put the pieces back together again. And very few people were trying to fit the theories to the realities. Something appeared to be wrong.

Some notes on defining a "true" problem:

In general, the terms "true" or "real" refers to some element or fragment of a whole situation. The attitude and approach each individual takes towards defining an issue will usually provide the perception that is the basis of the problem structure. Boundaries are carefully drawn and controlled to allow for a tight set of relationships and a well understood set of parameters to orient the problem-solving effort. The one aspect which is usually missing from this array of information is the process of the search itself. This is the area where real problems are defined, in this vague and often frustrating condition of searching for the problem before one begins to search for the answers.

Because of the inherent complexity of reality, we often find the search limited to a preconceived notion of a model. The real effort here then becomes one of trying to fit the data to the model. We set in motion our observations based upon the models that have given us the "clues" as to where to look. We try to fit the real to the artificial. Significant variables are often difficult to discern and cannot always be effectively quantified to "match" the requirements of the model. Value judgements have to be made and this situation is usually ignored within the confines of "normal" science (See Kuhn). A range of skills and methods might be needed to ascertain what is the "true" problem and to determine the goals that should be pursued. The process must be a reiterative one because of the vagueness and complexity involved. It is long-range and may require an array of different strategies to make sense out of the many different facets needed to resolve the situation. The skills needed by the individual as well as society have to be both flexible and integrative.

The Character of the Approach:

The identification of any problem, issue or situation, requires some means through which to recognize the "true" character of the problem. This may be accomplished through the transformation of the problem into an holistic perception: a conceptual, mental hologram of the situation. That is, problems are translated and examined within the context that reflects the totality of interactions impacting on or through that issue. This translation provides insights into the "real" identity of the situation and provides guidance in determining the behavior of any action on the whole system and/or within the system. Through the use of natural principles and processes we may then establish criteria for the design of an ecosystem. This second transformation from the holistic image into the designed system establishes the boundaries from which we develop the ability to assess alternative policies and implementing strategies. This occurs out of the conceptual framework (an ecosystem) that aids in our selecting and organizing information. Since the process deals with such a vast array of complex and confusing information, we must establish a reiterative process (policy) to feedback information and ideas in a manner that will adjust our approach and, hopefully, improve our perceptive powers. We want to clarify the degree of interaction that is present and make complex entities less confusing. A resultant force emerges (the true clients appear) to improve our awareness and sensitivity to the values and attitudes which play such an integral aspect of this approach.

Patterns of Interaction:

Actually achieving this kind of perception of each and every problem, requires some unique and innovative techniques. These techniques stem from an array of factors that constitute the complete environment. It must be recognized that it is not just the problem and its context that have to be considered, but the environment of the observer and researcher as well. This is why so few attempts to describe a specific, explicit and universal approach to problem-solving have never succeeded. Each situation is unique unto itself. Each event must be determined as it occurs - there is no one way - there is no one approach.

Those factors and conditions which present themselves, provide the basis for the design of any system. What is needed then is a process for viewing reality that will aid in determining the kind of system that is appropriate and "correct" for that particular situation.

"A theory in its day must solve the problems in its day."

J. Bronowski

<u>An Illustration</u>: One psychological technique is the use of free association as a means to describe the behavior of an event or issue. By allowing relationships to emerge from the process rather than an attempt to "assign" specific pathways for the design process, we begin to develop patterns of insight that are more comprehensive. I have often used this technique as part of a classroom situation and a game through which students are randomly chosen to carry on the process. This involvement of the students focuses attention and participation and is a definite aid in retention. It is amazing what a group of people can do to expose the relationships of an issue.

Pattern - industry - jobs - consumers - more people - because of more jobs - more consumers - they demand services - increased fire, police, schools, water, sewage, etc. - more taxes - predicament is that industry influences growth pattern and changes the character of the community - what are values of community? - visible growth - invisible growth - people focus on events and not causes - growth comes from unrelated decisions that are related - community cannot see relationships - media use - dilemma occurs since community should determine planning criteria - how to inform community? - time frame - who gains and who loses? - too many forces pushing on single individual to make decisions - what expert do you believe? - housing and land use taxes - boundary definitions - political decisions not bounded - people all have different boundaries - how do you bound the system properly? - is an umbrella approach possible? - laws force issues - educational system - regional government - who has the capacity to make decisions? - process needed to make decisions - deal with growth - economic impact reports - management of open space - what restraints hinder growth? - stagnation is impossible - ability to expand - expansion of one part will effect growth of some other part - population growth - making life liveable - what is quality of life? - who says - environmental and economic interests - intelligent planning - expansion of products or expansion of quality of products - dynamics of change - emotional issues - growth and progress are not necessarily synonymous.

This free association process is an attempt to establish some kind of holistic image. It is not a complete image in the sense of describing all facets of the issue, but it does display a range of factors that can guide our inquiry even further. It is a first approximation within a reiterative process that will add, rearrange, and orient information in a selective (operational objectives) direction that will evolve towards an improved image. By developing this pattern of behavioral factors a _map_ is created for routing information. A means is provided to select some problem-solving direction(s) rather than a "solution".

The concept of "solution" (as it is usually conceived) has little place within an ecosystems approach. Only _direction_ has meaning. Ecosystems are dynamic and so there are important reasons for their "solutions" also being dynamic. They should be designed to reflect the inherent flexibility of the system and its evolving properties. There is more than a semantic difference in this issue. One must psychologically retain the sense of alertness about possible modification as information is fed back through the system. The projection of "solution" is indicative of a very static and stable set of relationships that never really occurs. Any system that is balanced is a dead system. Living systems must "fight" to retain imbalance. All ecosystems are in a dynamic and evolving process of change. If this condition is not reflected in the manner in which we try to comprehend systems and in our methods for resolving them, then we will simply force the transfer from one state of disequilibrium to another.

Problem-solving Vehicles:

Problems, issues, situations, conditions, strategies, games, seminars, and discussion groups are all vehicles for the development of holistic images and perceptions. They are a means (when appropriately and effectively utilized) to portray the process of an ecosystems approach. They allow the process to be placed within a context that can be identified and understood by the participants. If this approach is dealt with outside of a context situation, it will lose much of its impact and meaning. To go from a linear and reductionistic approach into an holistic one generally results in a condition of holistic paralysis (to be discussed later). Some frame of reference must be provided to aid in the identification and understanding of the process. It takes the issue out of the realm of the possible and into the arena of the actual. The degree of acceptance and comprehension varies from situation to situation and from individual to individual, but some absorption of the perception does occur in everyone. We have to deal with reality the way in which we presently perceive it (regardless of how inaccurate that may be it is still the way it is) and with the level of awareness of the participants as they are. The ideal should never be lost, but it should also never be the only basis for action.

In Part II there is a list of many of the different types of vehicles that I (and others) used in the CNR program. This list is neither exhaustive nor as informative as it could be. Constraints of both time and length prevent a description of the actual environments that were designed and the behavioral patterns that emerged. The effort is extremely energy draining. The more flexibility that you have in a system the greater the energy required to maintain it. The ability to succeed in what you are doing can be enhanced through this process, but it becomes difficult to maintain the level of interaction. I personally worked seventy to eighty hours per week (not counting the total time spent during week-ends) for nearly three years to sustain the effort. As there were insufficient funds to obtain the kinds of resources required, the greater part of the actual effort fell to the active cadre of faculty and students who all reached into their store of energy to provide the viability needed.

This energy consumption is not at all unusual for an interdisciplinary environment. All interdisciplinary efforts follow a similar pattern - overwork and small rewards in the traditional sense, but tremendous rewards in the holistic sense. By viewing our efforts in this context, the rewards vastly outweighed the costs. So much is given through this effort but so much more is returned. This cooperative sharing requires changes in our values and compromise in our methods, but the cohesiveness that often results provides a momentum and interaction that reaches beyond the individual capacity. The processes through which one must work becomes as important as the objectives that one is working towards. But if the trauma created by the process is so great that it defeats the very satisfaction that one gets from obtaining that end, then it is of little over-all value.

Preaching: I am not trying to say that pain and discomfort are not part of life and even necessary to change habits or to accomplish certain objectives. Physical development represents one such area where the pain in our muscles can be tolerated only because we visualize that our overall health will be improved by the process. It is only through this holistic understanding of the implications of the process of exercise that a rationale for enduring pain is provided that makes it worthwhile.

A note on the concept of achievement:

One of the most serious problems associated with achievement as a dominating goal in educational institutions today stems from the following situation. Whatever level of achievement is chosen, some individuals will reach that level and some will not. Those who reach that level will definitely feel superior for having accomplished what others have not. The reward structure of society constantly reenforces that condition. Those who are unable to reach that level will generally feel inferior. In either case there is a lack of any holistic insight within the context of the ecosystem of which they are a part, and the interfaces that must be maintained for social contact and communication. No one should lose by their participation. Behavioral settings should be designed in a manner that makes the environment non-threatening and conducive to learning.

Courses in CNR:

In Part II there is a list of courses which were initially developed by me or with my involvement. In the majority of cases I acted as the instructor or as one of the instructors, but quite often this role would be supplemented by a faculty member who had the "legal" responsibility for the course. Since my position was that of an Associate and not a ladder rank faculty member, I was unable to teach most courses directly. This type of bureaucratic restriction illustrates the kind of response that I had to these teaching problems. Rather than expend energy trying to modify and convince the powers that be that their rules were constraining, my approach was simply to discover some method to accomplish the same thing within the given administrative structure. Many faculty members, because much of the real load was removed, did become directly involved in the courses. Sometimes, of course, their main interest was in making sure that a course was taught "properly". Many of these courses were simply vehicles for actively involving specific people or specific issues in the program. The time and energy required to pursue these many diverse pathways was and is instrumental to the success of the program, but it could not go on forever. Since we had limited money it became necessary to compensate the scarce financial resources with resources of other kinds. All of the staff and a significant number of faculty found the energy drain hard to cope with. Some of the faculty had made such a strong commitment to the program that their research (and consequently their position) suffered (not many more than ten according to CNR Review Committee in 1973).

Factors affecting structure:

In every situation there are unique aspects that impinge on the character and operation of an event. In the CNR program there existed certain factors which very definitely influenced the manner with which the administration was designed. To effect certain operational objectives, it became necessary to create and modify the administrative aspects of the program. Because of the uniqueness of different environments, and thus the ecosystems which are derived from them, there is no one way or method for establishing the behavioral patterns required for effective viability and operation. The particular character of the CNR program can never be duplicated in any other setting, or if in the same setting, within a different time frame. It stands alone for the primary reason that the conditions and the environment out of which it evolved will never exist in the same manner again. I am constantly reenforcing this principle because "traditional" science requires duplication as a means to provide validity. This is also why the criteria developed must reflect those "ways of thinking" and "questions for searching" that will have some usefulness within another context. Extraction of process must be cautious so as not to imply universal application when inappropriate. Thus I am trying to create behavioral images that will give insights into the kinds of questions that were asked within certain situations and the factors which then would impact on the decisions that were made. Thus, the usefulness of the criteria can be judiciously evaluated within the light of the environment from which it emerged. This perspective allows others to create their own images within their own context. Information can then be more easily and holistically transfered.

The Advising System:

In eliminating most of the explicit course requirements from the major, we created a situation that had a great many risks. There were many good reasons for removing these requirements. Since we were an interdisciplinary program oriented around an holistic and systemic paradigm, we held that all aspects of reality had relevance and value. It would be the antithesis of our own orientation to prevent exploration into areas of knowledge that were deemed valuable by the student and for which we had little justification in preventing. Even though we often failed to grasp the significance of some particular direction or approach to the search for understanding of an issue or situation, we explicitly encouraged that kind of investigation. For example, if a student decided to take a sculpture course but had little clear insight into why he/she felt that aspect to be of value, we felt that this opportunity had to be protected and maintained if we were to obtain unique insights into these complex situations. Synthesis and integration of knowledge and the coupling of complex arrays is often facilitated through this kind of exploration. Consequently, each and every course became automatically available to the student. For many students this degree of freedom presented only minor problems. This was exactly the type of opportunity that they had been looking for in their education. They accepted this flexibility with open arms. Yet, we often found and felt that this situation created some real dilemmas in terms of both obligations and responsibilities for the students. It also increased the possibilities that students would select a course which seemed to satisfy some perceived need but effective guidance was not forthcoming. We also recognized that we had to contend with the "real" issue of legitimization. At some point in time the program would no longer be ad hoc and would then be an established unit on the campus.

In the beginning our approach was to handle advising through the traditional system in which students were assigned to faculty members and it was the latter's responsibility to ascertain the student's interests and to aid in selecting courses which appeared to be suitable. This role was usually filled by a limited number of faculty on a rotating basis. They could operate "effectively" because the requirements were well-known.

Many faculty felt that they neither could nor would operate in this manner. In most cases the faculty were simply unaware of the type and character of the courses taught throughout the campus; in other cases the faculty just felt that the direction of the student was beyond their capacity to guide effectively. Most faculty members allowed their students a maximum amount of freedom, but many simply "forced" their students to justify everything that they did. The situation was extremely chaotic. Students were constantly complaining that there was a lack of continuity between the advisors (which there was) and consistency (obviously the students were inclined to think that this was necessary). There were few criteria available to guide the advising operation. We had a dilemma. On the one hand there was the problem of lack of continuity among faculty advising, on the other hand was the problem of possible structuring that would eliminate discontinuity but set in motion the factors and constraints that would result in the program becoming just another discipline.

We began to resolve this issue by utilizing a number of techniques. Since we always began with a healthy skepticism about what the problem really was and the variety of possible avenues for resolving it, we consciously "built-in" flexible approaches that could evolve as we learned. We were most definitely committed to preventing any kind of transition into another discipline. This meant that we would have to establish procedures that would prevent that direction.

By taking advantage of the attributes of both our students and faculty we were able to modify the continuity condition and turn it from a liability into an asset. We recognized that our student population was very diverse not only in their current educational interests, but also in their age, background and abilities, etc. Thus it appeared logical to try to "match" these characteristics between student and professor to aid in more effective interaction and to facilitate "good" advising. If students with certain temperments, personalities and interests could be coupled with faculty advisors who had similar attributes, then we could provide a reasonable approach for resolving the continuity and advising issue. In this regard, we began to survey our faculty to obtain sufficent background material on a wide range of subjects. By compiling this array of related aspects we developed a listing of improved images of those potential advisors as a means to more effectively <u>access</u> their total capabilities. With this list available we were then able to ascertain the character and degree of similar attributes associated with each student and then provide them with some names of appropriate faculty advisors.

Of course, this matching approach was insufficent by itself to insure that students would be matched with the proper faculty sinee there were many other unknowns associated with this advising situation. Much of what goes into making good advice does not lend itself very well to understanding through either surveys or written statements and can only be effectively identified through personal contact. This is where we hit upon the idea of giving each student three or four names of what would appear to be "first approximation" advisors and then allow the student to interview these faculty members. In this way the advising situation could be improved as the approach would benefit everyone. Students would be able to select an advisor appropriate to their interests and compatable with their values and goals (to some degree). Faculty would not be saddled (very often) with students that were incompatable with their own orientation and with whom they would feel particularly uncomfortable. We are not trying to obtain such compatibility that some exchange and interaction between these people will not lend to and develop in entirely new ways of looking at these societal issues. It is important that the interface in advising create new perceptions for both participants. By explicitly allowing students to change advisors at any time and allowing faculty to refuse to advise at any time (either party can cancel the contract), we resolved the issue of trying to effectively evaluate our advisors. Advisors that were incompatible or who were not effective in discussing their concerns with students were simply eliminated from advising roles as fewer and fewer students came to them for advice. (This is predicated upon the availability of a large supply of faculty as advisors) The most unsuitable advisors were obviously "selected" out. Students were also "guided" by this approach since they had to have an advisor; and, if at every turn they ran into opposition to their ideas, then they eventually began to either "modify" their direction or ideas or they would discover ways in which to explain it and make it understandable to others. Some students went through 12 or 13 faculty during their four years in the program before they struck a responsive cord. The number of times that they had to go through an explanation of what they wanted or what they felt they should be doing was an education in itself. Many students received the kind of direction in their lives that they could have obtained in no other way. The faculty who were exposed to this process were themselves educated through this kind of interaction. New insights exploded around us. There was a search for knowledge that transcended disciplinary approaches and transfered the ideas and feelings into practical educational processes.

A Community of Interest:

Advising was only one form of interaction and exchange. Advising never really stopped. It continued throughout the program and within a number of different environments and vehicles. No one faculty member could possibly advise a student given the range of interests and the diversity of their approaches and still do an adequate job. As each student developed and explored new pathways they also created and designed methods that had not previously been identified. This left many faculty and students somewhat mystified at times and also somewhat frustrated by their inability to evaluate their activities in the traditional manner. Thus some means had to be devised to alleviate this condition.

Again the means chosen was to diversify the environments and obtain a sufficently rich interaction between as many different students and faculty as possible. Through this diversity processes could be discovered, new methods of evaluation could be judged, ideas could be exchanged and flexibility could be reenforced. Faculty who had a particular problem would be able to advise others about their present methods for resolving that issue, and/or they would be able to discover techniques not previously foreseen that had emerged from others experience. In general, this kind of information is very difficult to obtain because of the typical operational structure of the university and the obvious problems of communicating across disciplinary boundaries.

Our approach was to design and develop non-threatening environments in which interaction and integration of knowledge could be affected. Some of these efforts took the form of courses taught in the program and also courses taught outside of it. In Part II is a listing of courses which were created, in part, to serve this purpose. If some possible point of interchange emerged from either faculty or student then this was taken as indicative of a possible coupling technique and nourished as a vehicle for enchancing that process direction mentioned above. Also in Part II is a listing of some of the different vehicles (environments) that were created to encourage and enhance the interaction and integration required by the holistic, systemic and interdisciplinary aspects of the program.

Within the context of these efforts, varying degrees of exchange were obtained. Sometimes the design was effective and sometimes it was not which is probably no revelation to anyone at all. The approach was never discarded because it had failed at any one time and for a specific set of people. Often the type of people or the place had as much influence on that failure as had any weakness in the concept itself.

The belief that something would work for <u>one</u> group or for only <u>one</u> time created a sense of caution on our part against attempting to solidify or legitimize any one particular approach. The only courses which we felt were worth designating as requirements for the major were those which had the capability of modification within the context of each circumstance. We felt that each course should be designed for each time period and situation so that the courses had the capability to evolve as information was fed back into the program and as we learned more about what was necessary to accomplish our objectives. Naturally, our objectives themselves were evolving as well.

Note: During the course of my involvement with CNR and even afterwards I have been continually asked to either "write down" or in some other way specify THE objectives and/or goals of the CNR program. Much of this concern was in the nature of a request whereby others could then evaluate the degree to which the program was able to meet its objectives. Was the program "doing its job?" There are no THE objectives within the context of this type of program. The explicit definition of objectives would destroy the very character of the holistic, systemic and interdisciplinary orientation of the program. To define these objectives *a priori* and outside of the context would provide means through which some specific method or approach could be evaluated and interpreted in a manner that would then determine its appropriate usefulness in "achieving" these "objectives." THE objectives evolve out of the environment of CNR and are designed by the participants in it. They evolve out of the need to identify, understand and resolve complex environmental issues and situations.

<u>Administration of the CNR program</u>:

The specific details of the administrative structure are of little importance when viewed from the perspective of exportability. Experience had again shown that it is extremely difficult to transfer specific organizational entities from one context to the next when the circumstances surrounding that new effort are entirely different. Success (however it might be measured) will not follow in the same manner. Certain properties can be gleaned from this operation, though, that may be of aid in the development of programs that have similar goals and characteristics.

The administrative setting was based upon a need to recognize and understand and eventually to implement <u>THE</u> objectives that had emerged within the time frame under consideration. These objectives had to be adaptable to a wide range of foci. They must not be so constraining that they would fail to respond to the perceived needs of the participants and within their interest. They must necessarily be designed to reflect the kind of flexibility that is such a dominating force in the program. To design the operational objectives appropriate to this end, some compromise had to be made with the traditional structures and modes of operation of the university.

The initial framework consisted of an Administrative Committee and an Innovative Course Planning Committee. The purposes of these units were to administer and plan courses. The Innovative Course Planning Committee (ICPC) was actually an outgrowth of the Committee which initially designed the central course, IDS 10, and subsequently the CNR major. The ICPC was subsumed within the Administrative Committee (AC) for the program upon initiation and was never really operable during the first two quarters of CNR's existence (the Winter and Spring Quarters of 1970).

The makeup of the committees is also of interest. In the very beginning, before IDS10 began, the Innovative Course Planning Committee (ICPC) consisted of a group of faculty and students who worked on the development of the CNR program and consisted of flexible numbers of individuals depending upon time commitments. The list of names included approximately 24 faculty and 15 students. When the Administrative Committee (AC) was formed, it was organized with nine faculty and three students. Also, when the CNR major began in Winter, 1970, the ICPC was restructured with eleven faculty and seven students. Both of these units became somewhat unwieldy and were eventually modified to consist of five faculty and five students for the AC and seven faculty and seven students for the ICPC. The creation of a policy of equality within the structure and administration of the program was a significant step in the evolution of educational programs in an institution of "higher" learning. One of the prime reasons for the ineffectiveness of these committees in the beginning was their unwieldy condition. With so many individuals involved and with many of them inconsistently attending meetings, the committees became little more than debating environments and very little operational or functional behavior emerged from their meetings. Decision-making was reduced to a bare minimum. The only effective thing to do was to reduce the size of the units and to clarify both their behavior and their responsibility. It was absolutely essential, in terms of any viable interdisciplinary activity, that their roles play an intimate and integral part of the functioning of the program. If decisions begin to rest on the shoulders of any one individual, then both the character and the direction of the program moves towards the attitudes and biases of that person. The interdisciplinary flavor of the group will begin to disappear.

There are many attributes associated with the development of an egalitarian orientation for the administrative structure and I will attempt to name some.

- It provided a sense of real cooperation on the part of both faculty and students.

- It demonstrated that the program should evolve as a joint effort on the part of both faculty and students.

- It implied that both faculty and students were the primary purveyors of knowledge.

- It explicitly invoked the condition that flexibility would and should be maintained because it prevented any one group from dominating the direction or character of the program.

- It encouraged attendance so that no one group would hold a simple majority from which to enforce its beliefs. (It turns out that faculty were often the innovators and the students were for the status quo.)

- It gave explicit powers to students which forced the faculty to listen to and be conscious of their opinions and attitudes.

- Students now had to deal explicitly with limited resources and educational problems that had a significant impact on their own learning. They had to learn how to handle a series of issues and situations that they had previously been unaware existed at all or from which they had many erroneous and naive impressions.

- Faculty were confronted with similar issues.

- Both faculty and students had to directly confront values and attitudes that were never before part of their decision-making process.

- A significant number of emergent properties began to arise from this context.

There is, of course, a great deal more of what was learned within this type of environment that could be construed as feedback and involvement.

It was anticipated that both faculty and students would be elected to these positions by their respective colleagues, but the students were the only ones who realized that objective. What I strived for was a collegium, but it never fully evolved. All students who served on the committees were elected by other students in the major at the beginning of each quarter and later they served a full year upon election. The faculty never did like the idea of elections and members of the committees had to be "talked into" serving or being assigned that responsibility.

It later became obvious that the administrative structure was inappropriate to the expanding and evolving needs of the program and a total reorganization took place. The AC remained the same, but took on more of the policy and development aspects. The ICPC became the Course Planning and Development Committee whose primary responsibilities were essentially to facilitate the development and evaluation of courses. A new committee was established as the Advisors Coordinating Committee (ACC) whose responsibilities were essentially to aid in providing communication amongst advisors and between advisors and the administrative structure. This new committee was composed of three faculty members and three students. It has been my consistent belief that this arrangement was an important and integral aspect of the successful and effective operation of the CNR program and as a way of maintaining its innovative, interdisciplinary, systemic and holistic orientation to insure that there would be a continuous flow of ideas and information into the decision-making process. While faculty are paid to attend committee meetings (as part of their normal duties) it is with the students that procedures must be established that will enhance their desire to participate and to make it part of their normal "duties." In many cases it was possible to provide course credit for the work that they would do within the committees, but most of the participation came from the realization that they had, for the first time as students, an explicit role to play in the operation of the program.

To reenforce the reasons that I believe this is an important issue I would like to relate one aspect of how universities behave that lends some insight into the effectiveness of this approach. Faculty are a more or less permanent part of the university structure while students are only temporary components. The transitional aspect of students provides insight and stimulation to the functional behavior and ideas of faculty. Since faculty are the ones who have to carry out the decisions and objectives of the program (at least in the sense that they have veto power over what takes place), it is natural that their values and methodologies would dominate. They are suppose to be the ones who "know more" than the students and they have a tendancy to minimize their energy input into administration and teaching.

Flexibility in an educational program requires additional time commitments for the participants. Faculty in general find these commitments to be in conflict with their need to utilize that time in a manner consistent with the kinds of rewards and benefits traditionally provided by the university. We see a tendancy to minimize those time commitments by establishing structures and procedures that stabilize the time consumed. The use of requirements in a program is just such a device that not only insures continuity of effort on the part of students in an attempt to provide a consistent product, but also releases faculty from such time consuming efforts as advising. It thus becomes essential that any program like CNR should have some methods for compensating for the efforts expended in the process and give some assurance that the program will maintain its flexibility and innovativeness in the face of a continuing effort to stabilize its behavior by establishing requirements and rules that would prevent this from happening. Through the use of student participation as an integral aspect of the functioning of our curriculum, it was my hope that some continuity of process could be maintained to insure innovation and experimentation. Even though individual students would continue to pass through the program, the very presence of this segment of the CNR community would enhance the desired behavior. Also, the program would continue to evolve in a manner consistent with the needs of society as fresh insight into the changing character and values would be built-in to the operating behavior of the program.

As just one example of the relative importance that the role of students play, let me illustrate their participation in the hiring of Teaching Associates for the program. These positions are for temporary faculty that teach in the courses and add much to the innovative aspects of CNR. These temporary faculty bring in new ideas and approaches as well as stimulate the activities of the students and permanent faculty alike. It is through the insistence of the students on the hiring committees that unusual perspectives are supported. A much more interdisciplinary flavor is available as a result of this attitude of students. The faculty tend to represent and encourage a much more disciplinary orientation for these Associate positions. The contrasts in attitude and perception tend to balance the needs of the program and bring the issues more directly into focus.

The majority of faculty who participated in the teaching of courses, advising came from the College of Agricultural Sciences and the School of Forestry and Conservation (now the College of Natural Resources). A certain bias was inherent in all of the operations of the program. Only through continued involvement of the students, and on an explicit and meaningful basis, could this bias be reduced to the degree where its impact on the character of the program was not overwhelming. Students would often (and quite vocally) provide the perceptions of an issue which had been (unintentionally) filtered by or from the disciplinary paradigms of the faculty.

One very significant failure of the administrative structure that definitely inhibited the effective operation of the program came from the comprehensive responsibilities of the Administrative Committee. The key aspect of this failure came from the lack of separation of the <u>policy</u> aspects from the <u>administrative</u> aspects of the program. Many difficult situations arose out of the conflicting factors associated with the setting of policy and the carrying out of those policies. If these functions had been separated many of these difficulties (individual program needs, course requirements) would have been reduced or eliminated.

The original intention of all of these committees was to provide an environment for communication and facilitation of desired efforts. This attitude was never fully realized because the committee environment was co-opted by the more traditional modes of behavior that one encounters within the usual committee structure. It was not within my power to "control" or modify the design of the committee's internal operating conditions, but I was able to catalyze certain behavioral patterns that made them more effective as facilitative environments. Fortunately, the evolutionary character of the program provides the opportunity to correct the responsibility issue and also to design a more effective framework for the kinds of interaction and operation that encouraged facilitation of ideas.

Some thoughts on the Community:

Who are the participants in this program and why did they involve themselves in this effort with the degree of intensity that they did? Participants came from all walks of life and with a diversity of values, attitudes and knowledge into an interactive process that fused their perceptions into an holistic image of reality. It is through the subtle but significant relationships of this process that the effort was sustained. The environment is more than the physical realities. It must and did include the complex interactions of the social, political, psychological and cultural aspects inherent in any ecosystem. To provide the kind of environment for the design and development of these comprehensive perceptions we require a knowledge of many factors associated with the synthesis of actions and ideas.

Another View:

My perceptions are also filtered. The participants should speak for themselves to provide the kind of insights appropriate to this understanding of the sense of community. The following statements are those of students from the CNR program and represent "recurrent themes" of their perception of the program.

- the embodiment of what education couldshouldmight be (cnr as an all-encompassing miracle elixir?)

- a unit of social interaction, cohesion, and spirituality (?oneness with the universe?)

- a source of direction and refuge from the sort of built-in confusion and alienation that seems to be bred right along with specialization

- a way of "beating the house"

- a flexible major

- a sort of training ground for environmental missionaries

- a way to design your own job

- "a sense of futurism and adaptability"

- "how economic systems affect the distribution and allocation of environmental factors (i.e., belief systems, land resources)"

- "to build long lasting even permanent relationships" (a wonder bread of academia?)

- "gain an understanding of process"

- "unlimited opportunity for self development"

- "knowing people"

- "integrating theory and knowledge with living and growing"

- "not a straight line, as the options for diverging are far too inviting"

- "maybe the two units i'm taking now will save me a hundred and eighty wasted ones later" (This is in reference to CNR 49)

- "being a freshman at berkeley is like being a virgin at an orgy - you spend a lot of time just satisfying curiosities"

and another impression . . .

> "I think every freshman student has felt the confusion and consternation of suddenly being cut loose from high school's and family life's restrictions. Berkeley is a hell of a place to be cut loose to - not bad, but often times extremely trying and difficult.

So you are here and quite possibly having a hard time getting your head sorted out. It is essential that you conceive of the University as serving you rather than vice versa - for in the later case it will, in time, impress you how the university as a whole is a mindless monster. An emotionless machine demands those IBM cards from you as does a sometimes seemingly mindless Board of Regents always demand that (ever-increasing) check.
However, (with the exception of the IBM cards, deadlines, University requirements, and checks) the University is PEOPLE. The mindless monster is the first thing that one encounters here, but the PEOPLE are here, too. Meeting them brings a sense of identity, understanding, and an easing of confusion and consternation, because by getting to know the PEOPLE you get to know what most of the University is about. Look a little; there are a lot of friendly, helpful PEOPLE around, but they can't be friendly unless you are. Take a crack at meeting your T.A.'s and Professors - they are only human, too!"

Dan Holmes, a CNR student

and in a letter to Chancellor Bowker of U. C. Berkeley:

"the exhilaration of studying at U.C.B. is such that I want to share it with you. The reason for choosing it (to complete my work for an undergraduate degree) is because there is something special here. When told to investigate Berkeley, I thought I knew better; I argued that fragmentation of disciplines and isolation of departments prevented the kind of educational process I was seeking. Fortunately, counter-arguments prevailed; and I visited #33 Giannini Hall, Loren Cole and the office of Conservation of Natural Resources.

What happened after that date in Spring of '72 is pure water flowing in a natural stream. I had renewed hope for a system that binds the student to the world in a flow through the portal or relevant education. Here was a university major that epitomized to me the life process; diversity, interaction, self-renewal and concern for the individual. I became aware as I stood in that office that here was something rare; and by comparison, it was obvious why I had been an early "drop out", there never was anything like this before.

I wasted no time reactivating a 24-year leave of absence and am now a joyful student. Here I find people dedicated to what I call survival values. The systems approach, the need for integrated problem-solving, awareness of interrelationships and the flow of processes are not amorphous, pseudo-religious ideals here, they are powerful concepts that are to be used. I find my excitement sustained as the Fall progresses. This is the practical model of the essence of ecology. It is participatory education where everyone learns from everyone else; it is a democratizing process." . . .

Marty Kent Jones

"Waxing poetic on the systems approach:"

One of the more difficult aspects to try to convey from the CNR program has been the personal feelings that transcend our involvement. An old friend who is also a potter once told me that a worker was someone who worked primarily with his hands. A craftsman was someone who worked primarily with his head and his hands, and an artist was someone who worked with his head, his hands, and his heart. Often you can pick up or look closely at an object and really see the love which went into its creation. You can "feel" the sense of concern and affection with which the artisan used their talents to express themselves. Even after the artist is no longer known, the love prevails. How is it then that this aspect can be identified within the context of the CNR program? Can you "pick up" a social system and look at it? Can you "feel" the love which went into its design and operation? How does one convey through sequential lines of words and phrases the holistic view that is in reality scanned as a pattern of perceptions? I know of no answer. I lack the talent to adequately express these feelings. I am constrained by my background. But I do know that there was love involved in the CNR program. It was a sustaining force that maintained the flow of energy through the system and also provided the glue that held much of the interaction together. It was a significant process in the behavior and viability of that ecosystem.

CHAPTER IV

SOME CONCEPTS OF AN ECOSYSTEMS APPROACH EMERGE

"The developmental process described in this essay has been a process of evolution <u>from</u> primitive beginnings - a process whose successive stages are characterized by an increasingly detailed and refined understanding of nature. But nothing that has been said or will be said makes it a process of evolution <u>toward</u> anything. Inevitably that lacuna will have disturbed many readers. We are all deeply accustomed to seeing science as the one enterprise that draws constantly nearer to some goal set by nature in advance.

But need there be any such goal? Can we not account for both science's existence and its success in terms of evolution from the community's state of knowledge at any given time? Does it really help to imagine that there is some one full, objective, true account of nature and that the proper measure of scientific achievement is the extent to which it brings us closer to that ultimate goal? If we can learn to substitute evolution-from-what-we-do-know for evolution-toward-what-we-wish-to-know, a number of vexing problems may vanish in the process. Somewhere in this maze, for example, must lie the problem of induction."

From: Thomas S. Kuhn, "The Structure of Scientific Revolutions." P. 170

An ecosystems approach should never be defined in a manner that would constrain its use. Definitions are used to make things or statements clear and explicit. They bound and constrain to include somethings and exclude others. Or if a situation is discovered that fails to be included within the definition of that concept. I prefer not to define the concept of an ecosystems approach for it has little initial value.

> "Abridgement of the concept in fixed images; arrested development in self-validating, hypnotic formulas; immunity against contradiction; identification of the thing (and of the person) with its function - these tendencies reveal the one-dimensional mind in the language it speaks.
>
> If the linguistic behavior blocks conceptual development, if it militates against abstraction and mediation, if it surrenders to the immediate facts, it repels recognition of the factors behind the facts, and thus repels recognition of the facts, and of their historical content. In and for the society, this organization of functional discourse is of vital importance; it serves as a vehicle of coordination and subordination."
>
> (Marcuse, pp. 96-97)

Ecosystems are conceptual relationships that have meaning for us as frameworks for organizing knowledge. They are images of reality that allow us to orient our perceptions. To transform an issue, problem or situation into an holistic perception without any direct means of utilizing this image will leave us in a state of holistic paralysis. A state of confusion exists concerning the array of information made apparent. We cannot effect changes within an holistic paradigm but only use this understanding as transitional patterns to convey behavioral relationships inherent in reality. These holistic images compose our operational environments. We cannot deal with infinite arrays of information - we must "reduce" the impact of infinites into some manageable form. Selecting and sorting the significant aspects of reality must provide insight into what is happening in reality. But what criteria do we use for making these selections? How do we compare our selections in a manner that will reflect their "true" behavior? Complex systems are counterintuitive. (Forrester) Our first impressions are usually erroneous because of our values, biases, and other filters. We must maintain an approach that will feedback information into a reiterative and flexible process that adapts and directs our design based upon this condition.

Openness to information and exchange of information is required so that individuals with differing filters can construct their own image without deteriorating its usefulness. To recognize that everyone perceives the same thing differently is a fundamental assumption of an ecosystems approach. Must I expect everyone to see the world through my eyes? This would destroy the essense and the core of any ecosystems approach. The diversity of perceptions is why it is important in the first place. It is because people have different values, attitudes and perceptions that environments have to be created that reflect the common interest in a context that <u>all</u> can identify. It is the existence of these diverse perceptions from which holistic images are created. Yet, a commonality of belief is required. A recognition that holism emerges <u>because</u> of integration and not in <u>spite</u> of it.

In holography we find that certain conditions within the physics of light can be utilized to create an environment for the construction of an holistic image. This image can be "captured" by a designed holographic plate which retains the image until a similar environment is recreated from which the image can be reproduced. All aspects of the original, including the behavioral components, are also recreated. For example, if the original image consisted of two objects, one behind the other, and the one behind is hidden from view when observed from a certain angle; then it will also exhibit the same properties in the reproduction. Thus, holograms not only "capture" the elements of the system but the behavioral patterns as well.

One of the unique aspects of this phenomenon is that the photographic plate upon which the holistic image is contained can be "cut up" into pieces (decomposed) and each piece will retain the entire image although there will be a loss of clarity. That is, some information is lost upon decomposition of the plate, but the "whole" picture is still discernable with all of its behavioral characteristics. This process forms the basic conceptual approach behind the design of an operational environment for the creation of holistic perceptions and the design of an ecosystem. By providing this kind of environment, individuals can obtain (through a synergistic effect) an holistic image which they will still retain with some dimunition of quality after leaving the setting. Group dynamics and interactive processes for the effective exchange of information, signify the functional aspects of holistic design.

Each image must be created within the context of the particular situation in question. It does little good to establish criteria that will have meaning only within the context from which they came. The approach created must never imply perfect transferability. Each ecosystem has its own unique properties, and the transfer of information, techniques, or entities from one system to another is fraught with danger. Transfers of some specific technology from one culture to another is one of the more dramatic demonstrations of this problem.

In the CNR program extensive efforts were made to reenforce this principle of ecosystem design. Illustrations of the character of these types of design environment can best be described through the participants own impressions. Each course was an attempt to establish a format appropriate to that particular set of circumstances. These following particular examples were selected because they are typical of the kinds of attitudes reflected by the participants.

> "As I write this paper eight months later, I am still amazed at the influence of the course on my opinions and view of the ecology frenzy. As "directed" as I thought I was before the class, I took a second look at my program and the CNR major itself through the eyes of seventeen other CNR students. The class probably would not have succeeded without the closeness of entire weekends together away from the city, for the class was our environment and we could not escape involvement. I saw personalities (including my own) undergoing changes. Learning to listen more closely to the opinions of others was my most important lesson, while other students learned that their opinions <u>did</u> matter. A few students really opened up when they started feeling that they were part of a group of friends."
>
> Jane Haggerty, A CNR student

and . . .

> "IDS 49 was one of the best experiences in my education. . . . It was never boring but occasionally frustrating because we got into ruts and didn't seem to get anywhere. I especially enjoyed the tour of Blodgett Forest. Here we got outside and for the first time I was in a forest with a forester who could answer a lot of questions I had. I would like to have spent more time in this Aristotelian method of learning with an expert so close at hand . . . Though I discovered how little I knew, especially about plants, and felt very ignorant, at the same time it made me want to know much more . . . IDS 49 will be a fantastic experience for first quarter freshmen perhaps not paralleled in structure and content until graduate school. It is the best class I have ever had for getting to know a professor or teacher and discover what he really feels and believes . . . The class is a great way to get to know other students well who have this one concern in common. Seeing that I wasn't alone in my concern and sharing many ideas was rather comforting and encouraging."
>
> An anonymous CNR student

concerning IDS 120 (Environmental Education) . . .

"I want to find ways to release this wealth of free learning material to be found outside of our boxed existence. I want to explore ways to utilize these tools to their utmost potential and implement these experiences at all stages of the educational process. I believe we would have fewer "Pollution" or "Ecological" problems if we would provide this foundation for our children; an excitement about anything, but particularly about their natural environment, not only in elementary school, but a self-discovery program that is continually reinforced every year of the educational process. Ecologically-sound living would hopefully become a natural by-product. We'd grow up understanding our relationship with Nature and how we are both inextricably dependent on one another and, therefore, can't abuse or exploit one without hurting the other. We would have reason to be concerned about ecological living - concerned not by individually burdening ourselves with the recycling of our materialistic discards of a progressive society - but concerned about each individual being an integral part of a cooperative society, sharing and working together with each other instead of competitively segmenting our individual energies against one another for capitalistic gains."

Carole Ann Rollins, in an application for a Teaching Associate Position and as a CNR student

on the role of a CNR major . . .

"Yet if I was asked, 'what is the purpose of the College of Agriculture?' and what was my role in it, I don't know if I could answer.

But if I was asked the same question about the Conservation of Natural Resources major, I would have no difficulty answering. Yes, I know my role. I have worked on the Student-Faculty Committee which administers the CNR major. The collective responsibility for its governance is shared by everyone who works in the program. Yes, I know its purpose. The philosophy, goals and curriculum have been discussed and debated hundreds of times - not in the private offices of provosts, deans and vice-chancellors (though they might have their own ideas), but among the actual participants - the students, the faculty, the teaching associates and the staff who work with the program.

The Conservation of Natural Resources students are interdisciplinary, prepared to synthesize and organize on many different levels with many different problems. We are not afraid of decision-making or taking responsibility. That, indeed, is the purpose of our education; confidence is not taught in the classroom, responsibility never learned from a book.

Only when students plan, direct and participate in a curriculum of their own design, inside and outside the University - learning to work with each other collectively rather than competitively - can they develop not only their skills, but also the commitment needed to realize their goals.

The role of the student within the College organization is minimal. Certain decisions are made by the deans, others are made by the department chairman, and whatever is left is jealously coveted by the faculty to the exclusion of anybody else - including students.

Boundaries between disciplines are closely guarded, as if knowledge was private property - trespass and squatting strictly prohibited. Academic programs are often so inflexible that for students the price of admission is the price of submission. When knowledge becomes a commodity, students begin to feel as if they are only consumers. They neither understand nor question the value of what they produce and they care little for what they consume. They do not seek pleasure from their education but an absence of pain.

Bureaucracy and indifference alienate students from teachers; competition and conformity alienate students from themselves. The academic community becomes no community at all - there is no self-determination and a great deal less self-respect. Cynicism crosses purpose; where there is alienation, there is apathy. Given this condition of education, many students logically abdicate responsibility. Decisions are avoided whereever possible. Upon graduation the search for security is almost frantic."

Rolf Diamant, a CNR student upon graduation

another impression . . .

"The establishment of this friendship along with friendships with many others in the class is, to me, the most inspiring experience which had an effect on my concept of CNR. Discovering the motivations and emotions behind you and the people in IDS 49 greatly enriched my comprehension of what the CNR major is. By using a totally inclusive weekend format as a class environment we were spared the trouble of 'compartmentalizing' part of our learning experience . . . We essentially lived the class for three weekends. . . . The arrangement made involvement much easier for myself as a sometimes insecure person. I gained self confidence which will last long after the class has ended. I found that I could provide meaningful input, sometimes with difficulty; something I had abandoned in other classes. . . I am glad that IDS 49 exposed me to the minuteness of the knowledge which I possess. I now realize more than ever that I must make a conscious effort to try as many things as I can in order to put CNR, as diversified as it is, into a proper perspective."

An anonymous CNR student

and a faculty perspective . . .

"Announcements were sent to all faculty in the College of Agricultural Sciences describing the course and asking for instructors. The response was terrible. Only three professors expressed a willingness to try and teach a very different type of introductory course. Many professors were contacted individually, but still no response, and in many cases skepticism or fear of such an innovative approach. Why? I think that the traditional structured background of most of the faculty, particularly in forestry and agriculture, are afraid of change.

The decision was made to try, through a series of week-end trips, to give new undergraduate students some direction. This is important particularly when there is so much flexibility in a curriculum. The course was also to provide an opportunity for students and faculty in the major to get to know each other. This was to be a more personal approach to teaching and an attempt to get away from the sterile lecture technique.

As I see the course now it was an invaluable experience for me. For the first time I have seen undergraduate students as real people and friends, in other words I have finally seen students in three dimensions. From this standpoint the course was all "take" and a truly unique educational experience for me. I worry, however, as I don't know how much I gave to you as far as direction in the CNR major. I feel that I may well have failed to attain one of the objectives of IDS 49.

I wonder why I may have failed. Is my background and approach so structured that I can't mix educational and social experiences? Is the course too modern? Are new undergraduate students ready for a seminar-type course when their educational backgrounds are highly structured? Are students in our educational system ready to take the responsibility for their own education when they have never been given the privilege before?

. . .

For me the course was a beautiful experience with 15 lovely people. This experience has caused me to reflect on my teaching, research and social life. I have spent many hours evaluating and reevaluating where I'm going. I have also thought much about each of you as students and as friends and I worry about where you are going in this troubled world. I wonder if you will become as negative as I am when you reach my age. Actually, I'm not nearly as negative now as I was because of my experiences with you in IDS 49. I really don't think I could take the emotional drain of teaching IDS 49 again for two or three years." . . .

Donald Dahlsten, Associate
Professor of Entomology

regarding a discussion of the grading in IDS 10C . . .

"I was greatly disappointed in one line of thought, which I consider to be internally incompatible. The concept was advanced that the basic problem underlying all of our environmental issues is the social system in which we live. To paraphrase these ideas, I believe accurately, our social system, which emphasizes individual competition rather than cooperation, individual gain over social achievement, and human value based upon what a person is, or does, or earns, rather than upon equal value as human individuals, must be changed before environmental problems can be solved; that the arrogant attitude of man's conquest of nature and the egotistical exploitation of one individual by another must be altered before humans can take their rightful place as an integral part of the total environment. I believe this is a powerful and profound concept - one that is worthy of significant consideration, both by those seriously confronted by it for the first time <u>and</u> by those who espouse it. In my opinion, the fundamental bases for such a change are cooperation, understanding, tolerance, flexibility, compassion: in short, love. The concept was introduced into the Thursday night discussion in support of changing the course to a non-graded one, the rationale being, I believe, that the grading system, and the University's educational system in general, promoted the very values that are considered by this logic to be antiethical to the solution of environmental problems. The conclusion of this line of thought is that it is eminently appropriate for this course to make a concerted effort to break with the traditional academic system because this is, in fact, what part of the focus of the course is "all about". The terrifying incongruity came when the person presenting this line of logic insisted that it be applied <u>this quarter</u>. When confronted with the fact that the course was nearly half over, that students had signed up for the course under the impression that it was being given for grade and credit, and that it was too late to change to another course, essentially making the students a captive group, the statement was made that any students who insist on a grade should be assigned an "F", since they obviously have missed the central lesson of the course: cooperation. For those students, however, who chose to function under the present system or whose opportunities to achieve certain goals, such as a June graduation or entering graduate school that requires certain grades for entrance, might be destroyed by either the lack of units or an "F", this extension of a powerful line of logic I believe is illogical, since it ignores the other concepts that, in my opinion, are central to the proposed system of cooperation: understanding, tolerance, flexibility, and compassion. I believe this is an example of one circumstance where an action could be disasterous when not preceded by critical thinking.

Finally, I would like to share with you a value judgement. I got the overall impression from the meeting Thursday night that we were a group of people pretending to discuss certain issues concerning the course, but instead were close-mindedly attempting to indoctrinate one another with our own points of view. I believe a major goal of everyone in the academic community should be a search for truth, as he can best interprete it. To this end it is incumbent upon the person with formulated ideas to challenge them with as broad a spectrum of conflicting ideas as possible. "Hearing without listening" is insufficient. This was not an unique occurence with our meeting, but seems to be a fairly common problem of our current society; perhaps it is another one to which we should address ourselves in IDS 10."

Wayne Wilcox, School of Forestry
and Conservation

some general comments on IDS 10 . . .

"The course, as I understand it, originated as a student initiated course. Not surprisingly, therefore, there are many students who apparently view it as an opportunity to get university credit for efforts to ameliorate an environmental problem, and are but little interested in learning about the gamut of such problems.

Other students with less of an activist bent apparently find the survey nature of the course quite frustrating. Very brief consideration of a whole array of problems with the interrelationships among them not at all clear to them leaves many students dissatisfied. The average student's inadequate preparation in fields such as science, economics, business, institutions, technology and law (to name but a few) militates against real understanding. And to cap their intellectual difficulties to be told that there just are not generally accepted answers to manh of the problems is completely unacceptable to some of them.

There is certainly no lack of written material on environmental problems. Most of it is in periodical articles or collections of essays - many of which disagree with similar writings. At lease some of the students sorely miss a well organized, coherent text with the course following pretty much the same route. To summerize: a course of this nature is a most difficult pedagogical task."

Paul B. Stewart, Professor of
Mechanical Engineering

These quotations should provide an image of what took place and how people who were involved felt about what happened. There are, of course, many more impressions that would differ substantially from what I have presented here; but, the attitudes reflected by these statements do, indeed, reflect some of the diverse array of opinions and values contained within the CNR environment. They are not intended to convey a comprehensive image of what transpired, but simply to give some insight into the behavioral characteristics of the program. The statements stand by themselves.

"Swallowing the whole prevents neglect." Benjamin Franklin

<u>A note on teaching</u>:

Sensitivity towards others and the translation of this awareness into effective communication is the key to effective group dynamics.

> "So much of the course depends on its leadership than an insensitive group leader could completely ruin the class. The professor in charge must guide the discussions skillfully subduing some students, while drawing out others. He should try not to dominate discussions or turn weekends into a forum for his own opinions and professional work. He should be able to organize unstructured situations without appearing obvious. He should try to drop his professional distance and become part of the group."
>
> Jane Haggerty, a CNR student on teaching in CNR 49

The teacher for all of these courses must be a skillful discussion guide. No one should dominate either as a personality or in the discussions. These factors require a range of techniques (plus experience) to function effectively within different situations.

Many of these situations require the development and design of techniques appropriate to the given conditions. I designed a specific approach out of the need to find some methods for enhancing and encouraging interaction and discussion. This approach is called the Quaker Method since the central idea came from my perception of the behavior of the Quakers in their meetings. (I'm not so sure that this is the most appropriate name for it) It appeared to me that part of the problem of good communication and discussion stemmed from the fear that people would have in making comments or expressing their ideas. They felt threatened and thus reluctant to speak out. Something had to be done that would reduce the group's attitude towards sharing and learning and also reduce the anxiety of the participants. Many people also had a very difficult time listening to others. They were usually so busy detecting faults and concocting responses that they failed to comprehend what was being said.

The general idea of the method is that certain properties of effective communication have to be learned through a designed and structured environment (an ecosystem design problem) that will provide the setting through which certain individual and group attributes will evolve and eventually emerge. The behavioral setting presupposes the direction of the process but the outcomes vary as the content and character of the process evolve.

The rules: After a specific topic for discussion has been chosen, the group must rotate turns for speaking. Each person takes their turn at talking on the subject for as long as they wish. If they do not wish to speak they simply pass the opportunity onto the next person. No one should be coerced into talking. The opportunity to talk will thus pass around the room (it helps if everyone sits facing each other) and each person takes their turn. The central rule of the method is that absolutely no one else may talk while that one person has the floor. The others in the room must remain absolutely silent during the period when they are not themselves talking. The only way in which the process works at all is when the participants realize that when they are talking no one will either interrupt them, debate with them, or in any way make them feel threatened. They must feel as free as possible to express themselves without having to defend themselves.

The process is not learned in the first effort. It takes time to adjust. As a speaker, one has to learn that the way in which we frame our conversation is largely determined by the perception we have of the kinds of response forthcoming by those within earshot. We purposively structure our statements to justify the expected disagreements. We have not learned how to talk in a way that will communicate our ideas, but generally to engage in interaction and debate.

There is also the issue of learning to listen. We are not taught how to listen. (Even when we are, the real opportunities for doing so are very few) Really listening to what someone else has to say requires discipline and patience.

The process also requires that the opportunities given for each person to speak be at least two. This allows for a tremendous amount of rhetoric and non-essential statements to be discarded by the group. Because of the delay in time when waiting a turn to speak, participants tend to evaluate the comments of others. The statements that appear to have the most critical and astute perceptions of the issue under discussion will usually emerge and dominate the conversation.

Quite often a consensus will form, but it is not central to the process. The more often you work within the method the easier it becomes. It is extraordinary how the time utilized in making a complete circuit will be reduced as experience is gained. I believe that people simply begin to realize that extensive statements and well justified arguements may not always be of value and much of the superfluous verbiage is eliminated. I usually go around the room as often as seems necessary to develop good comprehension of the issue and as long as interest is maintained. As interest wanes the tendency is to pass more frequently. One of the problems associated with the proper functioning of the process is the maintenance of silence and non-intervention on the part of the participants. It is always difficult to observe the rules in the beginning. Some people simply get "caught up" in the process and can't help themselves so some forgetfulness occurs initially. I try not to intervene to stop the intervention or to reprimand the transgressor. If it is done at all, I believe that it should be done by the peer group, but generally I prefer to let the transgressor "discover" their error for him or herself since the embarassment tends to reenforce the observation that it shouldn't be done and makes the person more conscientious. There are a great many other aspects and attributes to this process, but this discription should provide the general idea.

"I swear there is no greatness of power that does not emulate those of the earth,

there can be no theory of any account unless it corroborates the theory of the earth,

no politics, song, religion, behavior, or what not, is of account, unless it compares with the amplitude of the earth,

unless it faces the exactness, vitality, impartiality, rectitude of the earth."

Walt Whitman

Stresses in the social environment have a tremendous impact on the character of our education (and on everything else as well). Everything we do rests upon certain assumptions. These assumptions are usually based upon notions of behavior and reality that allow us to pursue our investigations into some hypothesis about certain observations. In economic theory the basic assumptions of utility theory and "economic man" are central to the core of all that arises out of our interpretations of economic systems. Yet it is understood by others outside of the field of economics that these are only two concepts out of a range of equally plausible explanations for our behavior. Thus it should be obvious that there exist a divergence of perception as to how Nature behaves. This divergency might be called the perception theory of relativity. It depends on where an observer is standing as to how a situation or event will be identified and understood. It is in this initial perception that the filtering of information occurs and determines the character of the "solution" proposed. Thus, an economist would never be expected to propose a biological solution to a problem since biological information is outside the domain of his interest. Their filters would prevent them from even recognizing the validity of that observation. I submit that an essential aspect of anyone's education and of any problem-solving process <u>requires</u> the recognition that perceptions are relative and are an integral aspect of our value systems and constrain and mold our attitudes and actions.

<u>Note</u>: Frequently, there is another threatening aspect to those who are considering an involvement in some interdisciplinary activity. This

- Can the information be easily applied by others?
- Can the information be easily communicated to others?

"The flow of energy through a system acts to organize that system" Harold Morowitz

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Use the size and momentum of the system to your own advantage for effective management of the situation.

One does not have to endure everything to experience it all.

When there is an impasse one must find some technique for restoring the flow - the direction of the flow. Music, meditation, walks, work will all act as vehicles for the transformation processes that will reestablish a sense of purpose.

Survival is often measured by our ability to adapt, easily and swiftly, to the changing character of our environment. Regardless of the inherent adaptable capability of the species, or the individual, one must first be able to sense changes in our operating environment. It is this sensitivity that provides us with security as much as it is our flexibility in adapting. (It is also a major source of our insecurity) This aspect of learning is one of the more important objectives within an ecosystems approach. To provide a critical sense of awareness and understanding of our environment and the concurrent ability to act on that awareness is central to this approach.

The life force is inexorably sustained by a delicate balance of intricate relationships.

The paper clip:

This is an illustration of the critical sense of awareness appropriate for the recognition of the interrelated aspects pertaining to one element of a system. Many individuals have a difficult time adjusting to the kinds of systemic thinking process essential to the recognition and comprehension of an holistic image. Our usual procedure for handling complex relationships in systems is to reduce the effective and identifiable items into models that simplify reality. By the manner in which we normally simplify the complex we generally feel that meaningful insights can still be obtained. Our fairy tales dominate our actions. What is really required is not the simplifications of complex arrays, but the clarification of the relationships that form the behavioral patterns of complexity. We need to make complexity less confusing and not less complex.

What is the pollution of a paper clip? Certainly it is, at the most, a very insignificant portion of the total pollution and its effects in our biosphere. But then again, is the pollution really so insignificant in terms of the processes through which the paper clip must be transformed into a usable object. If I am to ascertain the effects and implications of this element within the system, then I have to be cognizant of the transformation process inherent in its experience.

The paper clip is present in my hand because I extracted it from a <u>box</u> which I had to purchase at a <u>store</u>. The box that the clips come in is usually made out of paper (trees) and is processed in a paper mill. Humans are involved in the operation of these efforts and they have to be fed and housed. The paper box is transported to a paper clip manufacturing plant over highways and railroads, which also require an array of resources, both human and material. The resources that go into bringing the manufactured box of clips to the store are also extensive. Such things as tires, gasoline, also contribute to air, land and water pollution. Now the paper clip itself is manufactured in a plant which requires lights, water, buildings, and machines which take the raw material of metal and convert it into wire and then bend and fold it into a form which is the clip. (How about that!) The machine that does it all and the materials involved come from such places as the iron ore pits of Minnesota whose slag heaps and dumps pollute Lake Superior with asbestos as a by-product of its extraction. The iron is smelted with the use of coal which is often stripped from the hills of West Virginia or obtained by miners who may develop black lung disease from exposure to coal dust.

Thus, in a very restrictive way, one can begin to see that the "pollution" of one paper clip is still negligible, but only because of the marginal influence the one clip has on the total processes involved. If one looks not at the <u>degree</u> of effect but rather at the essential relationships of the transformation process, the complex pathways begin to appear less confusing. The complexity involved becomes comprehensible.

The web of interactions convey the structure of its impact and provide insight into where these impacts will be felt. The perspective ceases to be that of the paper clip and becomes that of the system. The paper clip weighs very little, but it is quite heavy in terms of the supportive energy and materials that make its existence possible. This web of information is of little value, by itself, in making decisions. The marginal influence of one paper clip offers little in the way of management insight. Nor does it really lend clarity to any specific set of objectives for they have not yet become known. What we have, at best, is an holistic image obtained within the context of a specific level of resolution. This is not an hierarchial level but a perception that at different times and through different degrees of insight, will give some knowledge about the environment within which this object exists. We now have a context from which we may begin the re-iterative process of ecosystem design. From this designed ecosystem there will emerge the management criteria for the kinds of objectives (goals) that are determined. We do not manage our environment; we only manage systems: in this case an ecosystem.

Often, people will avoid the use of "holistic" images because of their inability to transcend the holistic situation itself. There is a general recognition that the more one knows and is aware of, the better off one is in terms of where one stands. But most people find the holistic paradigm to be confusing and frustrating. Holistic perceptions do not appear to be very helpful for resolving complexity and, therefore, they are avoided. The question is often asked: "What do I need to know all of that stuff for, I can't do anything with it?" People tend to become paralyizied by the vastness of it all. It simply astounds them.

It freezes them into inaction. They dare not move unless they create a rippling effect through the system that causes even further complications. They have arrived at the most serious aspect of the use of any holistic approach for understanding of Nature. They have developed holistic paralysis.

Insights into the concept of holistic paralysis:

Individuals begin to edge closer to a set of constraints that inhibit their willingness to "go too far" for fear of gaining insights that might make them aware of more than they would like to know. Why is this so? What are the factors that make people to want to know only so much and no more? I believe that there are many reasons (as there always are from a systemic point of view), but that one possible factor is the realization that too much information cannot be effectively or efficiently handled by methods known to that person and thus any additional information becomes superfluous, constraining and also threatening. (The threats to ones values are very important here.) This is very much like the concept of overloading in an ecological system. These systems have a carrying capacity that allows the system to recover at some level, as determined by the homeostatic mechanisms available. As inputs into the system are increased, (e.g., effluents) the feedback mechanisms respond to bring the system back into balance (a dynamic balance). At some critical stage (i.e., a critical zone of irreversibility according to Wantrup) the system not only becomes overloaded, but is also unable to deal effectively with the quantity of material that it was capable of handling before. The factors affecting the proper functioning of the system have been disrupted. The situation is now one in which instability dominates the behavior of the system.

Individuals are also ecosystems and behave the same way. The operable analytical mechanisms of the mind prevent any kind of meaningful interpretation of the information being received. The conceptual framework available to most people is of a linear character and not a systemic one, resulting in a state of holistic paralysis. (I do not wish to think about things that I do not think about!) The "right" information in the "wrong" conceptual framework does little to enhance perception of the issue.

In the CNR program we saw students whose realization of the inherent complexity and interaction of environmental situations could be increased, but they became frozen in terms of their motivation and actions. They became unwilling to deal with "problems of over-whelming difficulty." That is, their common reaction to any situation where they had sufficient exposure to recognize the interrelated character of the issue was, "Now that I have the whole picture, what in the hell do I do now?"

So what the hell do you do?

The image should come first, even before one knows what it means. The immobilization process comes about because individuals lack the criteria necessary to begin the management (understanding) of complexity. It is not simply the fact that they have brought into focus as many of the relevant factors as possible. They have to learn to ask the "right" kinds of questions about the system they intend to design.

These questions stem from the desire to make order out of chaos. They must reflect the need to identify how seemingly unrelated things or phenomena are really related. In the CNR program as in any other effort the direction and the process must be evolutionary in character. It must also be reiterative in orientation. Changes have to be possible in a vertical sense so that students can pursue similar objectives along different pathways. Changes must be possible in a horizontal sense as new information is discovered and fedback into the process. New courses will evolve, formats will change, evaluation procedures will be adapted to these dynamic images. Since the future is uncertain, flexibility must be maintained. Needs must be filled immediately to reduce lag time in the feedback network and enhance the search process for the present. Students must have a real choice - in all of their decisions. Not just a paper choice - not just an either or choice - but as "free" a choice as possible. Compensation must be made to enhance the choices for individuals who have limited knowledge about the system that they are operating in (in this case the university structure and courses). Thus advising must be significantly improved and altered to provide this need. Advisors must be both friend and "devil's advocate" to aid and guide the student, not to constrain the effort, but to facilitate it.

Paralysis comes about not only from knowing too much and an inability to do anything with the information, but also from the fear that whatever is done with the information (the decisions that you make) will only lead to further perturbations in the system. It is partly this basic construct of fear that inhibits the desire to act and think in this manner. Dr. Fred Cutter in his, "Coming to terms with Death," tried to show how the source of all anxiety is the fear of dying: not just dying in the physical sense, but also in the psychological and social sense as well. We are often constrained by the fear we have of what dying will do to us as a person. Simeon in Man's Presumptuous Brain, illustrates the degree with which psychosomatic illness manifests itself in our own system as a consequence of fears which have evolved out of physical adaptation that has gone unmatched in our social evolution. Fear is a very important aspect of our lives that creates pressures on our own ecosystems and eventually pervades our behavior. This fear, I believe, stems from our anxiety about rejecting one type of thinking for another. Here we are, some people think, trying to get a handle on analytical processes and along comes some clown with a way of thinking that is alien to all that we have been educated to believe. It is very frustrating.

Paralysis can only be overcome when one begins to modify the habits, values and other sensory filters that inhibit us from the development of open and responsive consciousness when observing reality. We must create new design values that allow for exploration and searching through unique pathways. We need open-ended and sensitive processes for both research and actions, multi-dimensional pathways for pursuing perceived needs and goals, a diversity of methods.

Paralysis is broken when we feel comfortable with flexibility; when we are able to adapt and adopt as the situation changes; when we are not locked into one particular paradigm for problem-solving; when we have available an array of techniques; when we do not know everything, but when we have reasonable access to the knowledge of where to go to find out about it. Only in this way can we begin to create holistic images and patterns. If we have processes available for comprehending these complex sets of interrelated factors, then we will have some confidence (lack of fear) that we will be able to identify, understand and, if we wish, to manage these systems.

If I were to observe some specific system, let us say a plant, as an organism (an explicit hierarchial level of organization), and if it were to be my purpose to somehow manage this system (ecosystem), then I would want to know the behavioral patterns and processes through which this plant exists and remains viable. If I am conscious of the <u>needs</u> of the ecosystem (e.g., sun, CO_2, water, nutrient, etc.) I am able to determine what some of the criteria would be for <u>health</u> in that system. I am able to obtain an image of this dynamic system within the context of the environment that makes it viable. Therefore, an array of processes are set before me from which I might select some specific set of properties that may allow me to "manage" this system in some specific way and for some set of objectives. (The information can also be used to determine the appropriateness of the objectives) Let us assume that our goal is to restrict the growth of this ecosystem. (The degree of restriction is yet to be determined) Now I may take advantage of this holistic image that I have created by adapting some or all of the available attributes which determine and form its supportive structure (its viability). I can now begin to devise (design) some controls that will limit or constrict growth. I may block out some or all of the sun, or I may restrict the availability of water, or I may plant other plants around the base of this one to compete for the available nutrients, or I may introduce some consumer (grazer) to modify the productive capacity of the plant, or I can stop the growth of the plant altogether by cutting it off at the stem.

Thus, I have available an array of strategies (pathways) that will give me some degree of confidence that I am not without resource in dealing with this complex system. I am simply taking advantage of certain characteristics that are part of the dynamic process found in any ecosystem. If my concern should be the General Motors Plant instead of this one, then I would follow the same procedure for identifying the behavioral patterns of that specific ecosystem and that characterize its viability.

Processes thus become the carriers of information through an ecosystem. Just as a stream of water can tell you a great deal about what is happening in a forest by what it picks up and how it travels through the forest, so it is with all systemic processes that become links and coupling networks for systems. They form the basis for determining what is happening in those ecosystems. They are the dynamic properties that influence what is happening. They expose the behavioral relationships that give direction for resolution of the issue. Holistic paralysis can be broken by learning how to design effective problem-solving processes. It is through effective utilization of the systems approach that the paralytic condition is alleviated. But the cure depends on the diagnosis. If the diagnosis is faulty, then the cure (even if it is systemic) may be more harmful than the illness.

> "As all policy makers know from experience, policy does not consist in prescribing one goal or even one series of goals; but in regulating a system over time in such a way as to optimize the realization of many conflicting relations without wrecking the system in the process." Geoffrey Vickers

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Psuedo-Holism:

An aspect of psuedo-holism was described by R. Thomas Tanner of Oregon State University in the Dialogue section of AIBS Education Division News in August, 1972. In Tanner's thesis the condition of true holism manifests itself when the viewpoint is one of seeing the forest as well as the trees. It is in the context of the long view that holistic perceptions are formed.

> ". . . true holism does limit the scope of its considerations; in this it is distinguished from psuedo-holism. By changing all problems to "environmental problems," psuedo-holism renders the adjective meaningless, since it describes a concept having no non-members. A concept, to be useful, must include members but must also exclude non-members.

At first glance the above explanation seems both plausible and worthwhile. But in fact it totally misconstrues the significance of holistic thinking. I certainly don't want to be describing some thing and realize that my interpretation is being completely misunderstood by others. I also want concepts to have consistent meanings. There must be some common ground from which we can communicate with each other. Yet to state that the concept of "chair" is a useful one because there are objects that are not chairs and thus excluded from the category, is, in fact, a reductionistic approach in itself. There is the psuedo-holism. Is it not true that it is, in part, the manner with which the object is used that determines its classification? If I sit on a rock, do I not sit on a chair? For it is the functional behavior that is part of the recognizable and valid orientation of an object. The "true" holistic view does not interpret things under definitional constructs until the totality of its significance has been identified and understood. To take things out of context, a priori appears to be psuedo-holistic. To bound the perceptions forces the mind to filter what is seen by predetermining its orientation. If I have available a <u>definition</u> for chair, and I am looking at a rock, I may never conceive of it as a chair. Although the rock may very well be a chair. Children are very holistic in their perceptions of the world. They have not been <u>forced</u> out of that paradigm although much of our educational effort attempts to restructure childrens' minds into reductionistic and linear thinking processes. When children come onto a playground that has been neatly and explicitly laid out as a basketball court; they will adapt their perceptions and adopt their behavior to coincide with their own interpretations. The basketball court may become a ship with the stands and nets becoming the masts. Or, they may find themselves trapped on an island from which there is no hope of rescue. In any event, their imagination transforms their perceptions into holistic images that recognize different interpretations of the same entity.

<u>Quasi-Holism</u>:

If something is observed through a disciplinary paradigm; identified and understood from that context; then the information contains a disciplinary bias. If I put together an holistic image based upon information selected from disciplinary modes of learning, then I will have created a quasi-holistic image. Original and unfiltered images cannot be obtained since we are all subject to our own biases. Yet it is possible to develop holistic images in which disciplinary bias is minimized. By using specific techniques and environments, and as our experience in this method of thinking increases, we can begin to alter our perceptual capabilities. I do not think that is important except semantically, whether one uses the concept of holism or quasi-holism, but it is certainly important that one is aware of the properties involved in the different situations.

Most systems criteria examine how the parts of a system are interrelated rather than focusing on identification of the properties of the system as a whole. The parts do not always fit together because there is little in the way of an holistic picture from which to compare. It is somewhat like a jigsaw puzzle in that we often have to refer back to the picture on the cover to instill some sense of perspective on how the parts are oriented. Integration of parts is a systems coupling problem and the design of any systems structure should reflect both the difficulty and the attributes inherent in this issue (See Jenny and Schultz on the Pygmy Forest Story). Just as in working jigsaw puzzles; with experience the need to utilize and refer back to the whole picture is lessened as the nuances of interconnection become more recognizable. This does not imply that holistic images will become less important for different issues but that within the context of the same issue, the need to refer back to the holistic image diminishes with experience.

Quasi-holism has characteristics which are also similar to "second-best" approaches. It is also the result of thinking that present problem-solving techniques such as benefit-cost analysis need only to be "fine tuned" to satisfy holistic criteria. It is often felt by those who recognize the value of holistic thinking that they can satisfy the conditions of holism by simply <u>expanding</u> their frame of reference. Expansion through a line of thought that utilizes the same set of filters that created the limiting paradigm in the first place. One must be very cautious that one specific methodology does not "trap" you into organizing knowledge through a conceptual framework that constrains insight.

"For most tourists everywhere, the camera serves as a surrogate experiencer. Busying himself with exposure settings and focus, the traveler avoids having to make the pretense of enjoying present perceptions. He aims his camera into the abyss of the Grand Canyon, unaware of the futility of the art or of the pathetic figure he makes. At Disneyland he follows directions on markers that show him exactly where to point his camera to get the "best" angle, so that his pictures will be almost identical to those of his neighbors. Thus, he will gain comfort that existence does have an approved and recognizable pattern, and may even be real."

George B. Leonard

I'm more holistic than thou:

Since we do not know everything and we always need to know more - we must reflect on the character and operational behavior of all systems. I should never be "more holistic than thou," if the level of resolution that I have chosen to use will adequately identify the properties, attributes and behavior of that system, and for the stated purposes of my inquiry. The "depth" of my understanding is not as important as the "degree" of my perception. I need only know enough to recognize those patterns of interaction that provide sufficient insight into the processes for systems viability. The homeostatic mechanisms in ecosystems then tend to carry the process through even though I may be unaware of the totality of the implications. Feedback mechanisms must be accessed to "sample" from these processes and patterns so that I may modify inputs and direction and/or the pathways of interaction. With this designed flexibility in the management framework, I maintain a continuing observation of the behavior of the system so that I have the option of changing my approach as new information or better understanding becomes available. We must rely (have faith) in certain systemic processes. It is only through our belief in certain mechanisms and processes (biogeochemical cycles) that we provide some continuity in our understanding and our actions.

> "The man who embraces a new paradigm at an early stage must often do so in defiance of the evidence provided by problem-solving. He must, that is, have faith that the new paradigm will succeed with the many large problems that confront it, knowing only that the older paradigm has failed with a few. A decision of that kind can only be made on faith."
>
> Thomas Kuhn

Capture the moment and hold it:

By painting a picture or taking a photograph we are able to retain an image of reality for one moment in time. Since Nature is not static we must be able to capture dynamic images which reflect the continual alteration in the relationships within systems. A pattern must be available that can recreate the event and the relationships that provide insight into the implications of our actions. We must begin to take responsibility for our actions and this can only happen when we are able to make some determination of the impact of our actions on the system.

The weaverbird builds a nest using a pattern that is predetermined. It has no choice in the matter. We have a choice in what and how we do some things, but the consequences of what we do have a predetermined quality because they are not isolated from the same constraints that also direct the weaverbird. Our patterns also are constrained by Nature.

In Nature order has a purpose, and that is survival. So must our actions and decisions be directed towards the same goal. We evolved from, with and because of other species and our survival is dependent, in exactly the same context, with theirs. This is necessarily so since the environment which conditioned their evolution is the same as the one which conditioned ours. Even though we have (maybe) the capability to modify the environment to suit our particular desires we have lost the sensitivity to identify and comprehend the changing character of our environment so as to adapt to the new conditions. Not just through our inability to adapt in evolutionary time, but also in our discovery and implementation of the techniques appropriate for survival under these new conditions. The long-run outcome depends more on our change in values than on our change in technologies.

Ecosystems Sensitivity:

Developing sensitivity to an ecosystem requires appropriate clues for the formulation of new awareness criteria. If everyone was already at the same level of unawareness it would simply be a matter of determining the universal criteria necessary to bring everyone up to the same level. Unfortunately, the issue is much more complex. We all start from different levels of awareness and thus no one set of factors and/or methods will suffice. There is also a metamorphosis involved. No matter what level one begins with, there is an evolutionary process involved that will allow for the transformation from one level to another. One must, in effect, be preadapted. When something imposes itself in or on the system, it enters the domain of an ongoing set of processes and relationships. The questions which arise pertain to the impact of this disruption and the interactions that are subsequently transmitted through the system. This rippling effect must be traced through the system to determine the character and degree of control necessary to provide the transformation required. The questions posed should aid in our search for these impacts. But we need a "map" to guide us in our efforts and this map is drawn from our perceptions of how that system behaves. This initial perception is required for the determination of the level of resolution appropriate to this search. Since we are dealing with a reiterative process it should not invoke any holistic paralysis. The continuous cycling of our images will aid in refining the process and focus the information obtained.

The human animal approaches reality through an anthropocentric point of view which seriously biases the manner and degree of importance that is placed on any single observation. This constraint can never be completely overcome and will always act as a filter on the perceptions that we have. The influence of this condition can be reduced but never eliminated. Vigilance is required to prevent serious misconstruction of reality and the ecosystems that we design. Effective interpretation is still an integral aspect of an educational approach, not necessarily through traditional institutions but through all those vehicles of communication that can be considered as educational in character. What is required is not simply a modification in our <u>mode</u> of thinking, but a total and radical adoption of a different <u>method</u> of thinking. An holistic and systemic approach to the manner in which we observe Nature.

<u>A Systemic Mosaic</u>:

Since we are inferring what is to come from what is here, the basis for our actions stem from our present understanding of what is possible. In effect we want to look at Nature and detect those generalizable processes that will give us the insight necessary for predicting what will happen in the future. Certain factors must be identified in order to accomplish this understanding.

In weather forecasting, for example, the intention is to discover the association between temperature, wind, ocean current, humidity, and from the observed interaction of these components, deduce the patterns of behavior that provide the means for predicting how these conditions will effect the total weather pattern. As with any interpretation of the interactions in a complex system, there are obvious difficulties with making predictions. Often small changes in the system, at critical points and interfaces, will be transmitted throughout the system as large changes later on. As pieces of the system are integrated together, we often fail to detect the totality of relationships that exist or the degree of effectiveness of the feedback mechanisms that influence and control many of the interactions. It is not always possible to determine where the pressures on the system will be felt, or how the impacts will affect behavior. Even though a certain amount of stress can exist within a system there is a variety of homeostatic mechanisms operating to mitigate that condition and maintain stability. The questions must then pertain to the character of these mechanisms, their significance within the context of the system, the degree with which they can be manipulated, and the critical zones at which the process will be overloaded, viability is threatened and the recovery of the system will be in doubt (irreversibility sets in).

In such processes as food web relationships there is a need to reflect more on the totality of the interactions then on one specific species within the web. If we are attempting to determine the kind of impact that a particular action will have on an ecosystem, then we should be cognizant of the character of the impact as we are of the degree of impact on any one element. If the activity will effect a simple food chain in comparison with a more complex one, we can postulate that the consequences of any one activity on both systems will have a greater impact on the simpler one then the more complex one. Without inferring too much from any one concept in isolation from others, it is possible to make some judgments about where one should begin to look for effects arising out of some particular action. The importance of any one species is in part determined by its interaction and relationship with all other species in the same ecosystem. The perspective must come from the whole system to comprehend this mozaic of interactions.

Some notes on boundaries:

Boundaries (limits) are without value in the initial stages of developing holistic images. If boundaries (any constraints) are invoked *a priori*; then a strong bias is introduced that will inhibit effective understanding of the total system. This is not to imply that we can ever be without bias, or that significant bias is not also available through other factors. But, whenever we can reduce bias, we automatically improve the probability that we will have greater understanding (insight) into the situation. There has to exist an open and dynamic condition in which to pursue this approach. If for any reason we allow our minds to close around a preconceived notion of what we might be able to expect, then we have seriously altered our changes of identifying and selecting the "best" information. As VonDitfurth has mentioned: "Avoid drawing boundaries unless the problem itself is well-defined."

In my view, boundaries are important because they are a means for reconciling what you see with what you know to be there. They allow you to recognize certain significant parameters and processes that will effect the identification and understanding of complexity. They aid in the ordering of chaos. They aid in problem-solving by clarifying complexity. They make the levels of resolution effective by recognizing the implications of a condition without complicating the situation. That is the key - do not reduce complexity but make it less confusing.

Boundaries are conceived from every conceivable facet of reality. They are derived from the physical, social, psychological, economic, cultural, religious, parapsychological or any other area from which observations of Nature can be made.

For example, to find an address in a city, one could certainly explore the city street by street until the appropriate address was discovered. By using a map it is possible to improve upon that process to some degree. As we begin to add other pertinent information we begin to get some "direction" for how we are to proceed. It becomes possible to improve upon the process considerably and reduce the time required to find what we are looking for. The use of boundaries under the constraint of a well-defined goal can cut down the time involved and improve the search process considerably. The stage at which the boundaries are drawn will have considerable influence on our observations and the effectiveness of our problem-solving and decision-making processes. Boundaries must not be drawn until an holistic image is obtained. It is through a reiterative transformation process in the design of an ecosystem that boundaries will provide an effective rationale. They will create a framework from which a pattern of perceptions will emerge to guide us as a map through the complex array of information. This occurs within the context of a particular level of resolution.

In environmental problem-solving we often see boundaries being drawn before a full comprehension of the issue is developed. If the issue was mercury in S. F. Bay and cannot talk about it simply as a problem of S. F. Bay because it resides in that physical locality, I not only must trace its effects and progress through a system, but I must also be cognizant of the implications and impacts on that system from "outside" of the Bay, as that may have an effect on what happens to the mercury within the Bay. Interpretations must arise out of the systemic character of the situation. Mercury does reside in the muds of the bay bottom. It came primarily from the placer mining (hydraulic) in the 1800's that washed much of the mercury down the Sacramento River along with much of the silt. The silt covered the heavy mercury and placed it in an anaerobic (no air) condition. In salt water, in an aerobic condition, a microorganism breaks mercury down into various compounds, one of which is methyl-mercury, a highly toxic chemical that is easily transmitted through the food chain. It is anticipated that the use of "normal" flows of water out of the Sacramento River for the California Water Plan will have an effect (degree not known) on the inflow of water to the Bay. This will modify the effects of the tidal action on the Bay bottom and it is expected that the mercury may be uncovered thus placing it in an aerobic condition. No estimates of the degree of impact can be made at this time. (This information comes from Dr. Fred Tarp of Contra Costa College who did all of the work related to the discovery of mercury in the bay. His work has been substantiated by the Army Corps of Engineers)

Boundaries must be determined on the basis of some appropriate rationale and not just arbitrarily assigned. Although this will in no way insure that they will be either the most appropriate or the "best". The usual method of selection is based on convenience, historical precedent or they are impossed from "outside." In any effective systems approach the underlying assumptions must be questioned also.

In the CNR program one of the main requirements of IDS 10 was that each student, either alone or in conjunction with others, would develop a project associated with their own interests. The focus of their effort was only constrained by the character of the course. For nearly one year there was very little in the way of structure or rules to guide the student in their activity. Basically, they were required to "perform" in a manner similar to the typical university course requirements. That is, whatever they took on, they had to be "successful" at it. Whether it was a research project or anything else. Because of the orientation of the course, they were given a great deal of freedom to pursue and explore new and innovative ideas and approaches to these complex issues. Unfortunately, this did not happen as we had hoped. The students frequently chose projects which were of a type that took little energy and not a great deal of thought. (Many of them were lousy) For example, large numbers of collages were worked up the night before they were to be turned in or some research projects that were written in a very traditional analytical way. All of the teaching staff felt that this condition could no longer be tolerated. We decided to do something about the situation and this is how it happened.

Our first level of search was to determine if we indeed knew what the "real" problem was. What was the purpose of the project in the first place? Why were the students not taking advantage of what we considered to be a real opportunity to explore new approaches? We explored this process and we eventually exposed the character of the "real" problem. Within the discussion community a very real and holistic perception of our course began to emerge. Our exploration carried us through ground that had previously gone unnoticed or had been implicitly hidden. A communication process was provided that allowed feedback to occur in the system and aided in both our interaction and development. The environment did not deter nor inhibit the recognition of other aspects of the course that needed attention. The process itself provided the means to insure system viability and continuity. This initial phase of the interactive process did little to resolve the issue at hand, but it did "preadapt" the participants and provided some additional criteria for the design of an environment conducive to eventual problem resolution. We were now able to design an ecosystem that contained the appropriate properties. Without this initial exposure we would not have been able to determine the appropriate framework. The eventual approach to resolve the project issue required a number of alterations in the course. We were sufficiently aware of the systemic aspects to know that you can never do just one thing, but must compensate throughout the system for an action taken at one point if your intention is to maintain certain kinds of interactions. If stability is required, the manner in which one specific change will manifest itself in the system so as not to alter the stabilizing processes. Without going into the nuances of the interactions and changes that were instituted, let me just say that the central aspect of this new approach was in the modification of the underlying assumptions of project utilization. Our understanding of the issue was that students perceived the given "grading" required and the competitive factors involved as constraints on what they thought a "completed" project should be. The students felt that they could not take on any kind of "risky" project since the probability of failure was very high. (There was no well-defined methodology) They chose projects that appeared to have a high probability of "success" (completion). Thus, we instituted a "new" approach into university education - failure. That is, it was explicitly told to the students that they could chose projects and then fail to complete them and still get an "A". We really had not lost our minds. We compensated for this alteration in the usual pattern of behavior by modifying the basis upon which we evaluated the projects. Evaluation was still made on the content of the project and on the character of the issues and their presentation, but we now included and emphasized the learning process itself. Although this framed our approach through a goal biased direction, by using the students own objectives we were able to develop some criteria for effective evaluation. This technique simply opened up doors for the students. In both their techniques and the kinds of projects that they attempted, they began to innovate and explore. We still had a percentage of the make-shift types of projects (and this is in no way an attempt to demean the value of some of these projects). Students actually began to expand their horizons and demonstrate capabilities beyond what even they thought possible.

A Metamorphosis:

It has been my intention to use the CNR program as a vehicle for translating an ecosystem approach into an holistic image. Illustrating the behavior of this dynamic and evolving process within the context of a practical situation. The level of resolution that has emerged may limit some of the insights available, but it has been my intention to transmit the "sense" of what happened and not all that happened. It is also my hope that by weaving this tapestry of values and perceptions, the reader will obtain some patterns of insight into the implementation aspects of an ecosystems approach.

I have been able to glean many insights from my attempts to describe the CNR experience and my concept of an ecosystems approach. The process was a catharsis. A transformation took place in which I died. It was a healthy death. It was also very necessary. Without going through this experience of "living again" that time and place, the metamorphosis would not have occurred. It transcends explanation. I am now able to grow again and I look forward to it.

> "Inquiry is the creation of knowledge or understanding; it is a reaching out of a human being beyond himself to a perception of what he may be or could be, or what the world could be or ought to be."
>
> C. West Churchman

CHAPTER V

DEBRIEFING THE VOYAGE

A Learning Process

In applying an ecosystems approach to the design of the CNR program, some explicit concepts and processes have emerged. Emergent properties are characteristic of whole systems and they typically provide guidelines and pathways for comprehension of similar ecosystems. Having constructed an holistic image of the CNR program in the first four chapters, I would now like to change the level of analysis.

I want to shift the terms of reference in this chapter - not to describe, review or analyze the material further, but to change the context to inquire into what may be learned so that these observations may support more effective utilization by others.

Particular suggestions for future research have not been provided as I feel specific directions ought to be formulated within an explicit context. My discomfort arises out of a strong belief that effective implementation of an ecosystems approach must take place within an integrative and interactive (often interdisciplinary) environment appropriate to the situation at hand. The focus of any ecosystems approach emerges out of the design process and should be operationally determined from that orientation.

The holistic image of the CNR program can now be transformed and examined at three distinct levels of resolution. At the first level I develop eight major underlying themes that, based upon the analysis of a particular ecosystems approach, may characterize the implementation of an ecosystems model in other contexts. At the second level I identify some major premises upon which, based upon this analysis of a particular ecosystems approach, environmental programs in other contexts may be designed. At the final level I highlight some of the major properties that aid in the implementation of an ecosystems approach, based upon this analysis of a particular ecosystems approach.

Major underlying themes

Implementing an ecosystems approach requires the formation and acceptance of a conceptual framework conducive to effective action in or upon complex ecosystems. This implementing framework is based upon certain major themes that together form stategic criteria for identification, comprehension and design of ecosystems.

1. An ecosystems approach recognizes that the initial state of the ecosystem is less important than the direction toward which that ecosystem is moving.

   The creation of opportunities to find direction for understanding and for problem-solving pervades the design of courses and orients the CNR advising system. In CNR, for example, the Innovative Course Planning Committee facilitated the formation of diversified student generated courses and experiences that gave form to this search, rather than concentrating on the content and structure of a few specified courses.

2. An ecosystems approach does not simplify complexity but rather attempts to make complexity less confusing.

   The confusing aspects of complexity can be reduced by comprehending the dynamics of behavioral processes that will map the pathways for understanding. In CNR, for example, the advising system, courses, interactive environments and resource acquisition were all treated, not as structures to be mastered, but as processes that served as vehicles for students and faculty in finding their own best pathways. The interactive weekends of IDS 49, for example, provided an opportunity for exposure to a range of ideas and perceptions and an opportunity to discuss and digest the diversity of insights relevant to a complex environment - rather than attempting didactically to simplify and portray that complexity.

3. An ecosystems approach opens up access wider rather than attempting to acquire information faster.

   The extensive use of faculty and community resources and the design of structures that facilitate and encourage a diversity of interaction, forms the basis of opening wider access. Rather, for example, than attempting to generate more information about faculty and student interests in order to make central decisions about the "best" student-faculty advising relationships, CNR instead opened access to students who were encouraged to go out and interview potential advisors and then make their choices.

4. An ecosystems approach assists evolutionary processes (aiding thereby the realignment of sociocultural processes) by concentrating on an holistic perception rather than a reductionistic perception that often fails to include the emergent properties of dynamic systems.

An operating community establishes a frame of mind for the participants that enhances interaction and integration of knowledge. Holistic images and systemic ethics emerge out of a context that is conducive to the perceived need to understand Nature. In CNR, for example, the Administrative Committee reenforced the need to utilize an evolutionary framework by making continuous the reassessment of such major policies as curriculum, advising and budget.

5. An ecosystems approach provides a conceptual framework for studying the consequences of alternative courses of action for entire social systems; rather than depending on ad hoc methods that fail to recognize the linkages between subsystems.

The issue is not one of inadequate data but inappropriate methods for understanding reality. A rationale must be provided that will prevent the drawing of boundaries a priori. Eliminating boundaries initially reduces the filters through which we perceive reality. The course content and teaching techniques utilized in CNR, for example, provided a means by which the consequences of any action could be traced through a system whose boundaries are being redefined in the process of that tracing. Exposure to the implications of any activity within or upon an ecosystem, improves the probability that decision-making will reflect reality.

6. An ecosystems approach improves our capacity for informed action by fully integrating and using our environmental awareness and understanding.

A direct correspondence between learning and reality was established by preventing the isolation of both students and faculty from the contextual framework associated with their concerns. Involvement of all participants with such areas as administration, curriculum requirements, and program budgeting provided a synergistic effect on learning. Courses in CNR, for example, were explicitly correlated with the real world situations under scrutiny (the university is the community).

7. An ecosystems approach deals more effectively with the inherent uncertainty of Nature by attempting to design systems that reflect the evolving character of reality rather than assuming that the properties of the system are static.

The administrative structure of CNR, for example, was designed to reflect the need for adaptation and flexibility in a dynamic environment. Nothing in CNR was ever etched in concrete so that it could not be changed as the need arose or when new information was recognized. Thus, the courses and requirements of the major were continuously subject to concern and scrutiny.

8. An ecosystems approach explicitly mitigates against the dangers of holistic paralysis by utilizing a flexible and adaptive design process in problem-solving.

Overloading in any system (including human) can be alleviated by either reducing the material (informational) inputs or by increasing the carrying capacity of the system, or by modifying the way in which that material is processed. In CNR, for example, the program utilized a dynamic problem-solving process in all aspects of teaching and administration. The establishment of effective feedback networks, informational pathways, access routes, and other mechanisms appropriate to the evolving character of Nature provided the means and the directions for reducing paralysis and enhancing problem-solving. For example, in the Berkeley Marina Project, we chose a level of resolution that both allowed us to develop a comprehensive understanding of that situation and that required active resolution of the potential alternatives within the allocated time frame.

Premises that underlie the design of holistic and systemic environmental programs.

These premises establish some bases upon which an ecosystems approach can be developed within the context of an educational program. A more comprehensive set of parameters specific to each situation would be required for the establishment of an operational and effective program, but these perspectives should aid in focusing the direction of the design process. These premises then are to be understood as some major assumptions that undergird the application of an ecosystems approach.

- Current societal problems are too complex and interrelated to rely exclusively on present (principally reductionistic) modes of problem-solving.

- Systemic and synergistic modes of gathering knowledge are appropriate for identifying and understanding the character of these societal problems.

- A metadisciplinary approach to education is required to transcend disciplines in achieving these systemic and synergistic outcomes.

- Synthesis is at least as important as analysis. Considering that analysis requires the decomposition of whole systems into parts, then there is a concurrent need to reintegrate the parts to effectively ascertain the character of the whole.

- Modelling should reflect the world as it really is. Caution needs to be exercised when using models that fail to comprehend the totality of interactions in a whole system.

- Problems stemming from differing contexts require methodologies appropriate to that context. Education should reflect, incorporate and attend to the development of this skill.

- Educational programs designed with these premises in mind should gain acceptance as they demonstrate verifiable precedents, a recognized body of knowledge and concepts, understandable paradigms, limited threats to existing paradigms, limited dimensions to the program, quality control, and the ability to generate adequate funding.

- Programs should provide for flexibility in administration, curriculum development, space, faculty involvement, course units and structures, resource access, and educational direction and focus.

Some concepts and processes relevant for implementation.

When applying an ecosystems approach there are certain observations that one should keep in mind. These ground rules, guidelines, and decision rules are the outgrowth both of my participation in the design of an ecosystem - the CNR experience, and in this subsequent analysis. They represent some tactical ground rules that compliment the previously noted premises and strategic criteria displayed and focused on the identification, comprehension and design of ecosystems. These then represent some special tactical insights that may benefit others in implementing an ecosystems design process.

Identification of information in ecosystems.

Access is the key to effective understanding of complex systems. Uncertainty and the inability to accurately predict the future requires flexibility in adapting information and methods to the evolving character of reality.

Learning processes must maintain a dynamic quality to orient the search for knowledge. Boundaries and filters must not be installed that will foreclose our options and perceptions. Education must be a reiterative process that reenforces feedback to guide the direction of the search.

Integration of knowledge is facilitated by a focus that is inherently novel and cannot be exclusively defined within the paradigm of a discipline. The teaching and research orientation must not threaten existing paradigms. It must rather explicitly represent an expansion of knowledge and perspective that bestows life in terms of the intellectual health of the participants.

Levels of resolution can be determined by developing purposive directions in ecosystems. The operational goals of the clients in a system aid in the selection of appropriate information and boundaries. Mapping the operational level of resolution reduces the confusion concerning complex systems.

Comprehension of ecosystems.

Sensitivity to the existence of other pathways in a system aids in the understanding of complex societal issues. Recognition of where the channels of communication lie and the flexibility to adapt to different channels are essential properties for implementation.

Ecosystems design criteria require structures that enhance the processes of interaction, integration, cohesiveness, continuity, and a sense of community.

Boundaries determine the range of one's perceptions and are a means to reconcile what we think we see with what is actually there. This compromise must not be arbitrarily determined, but must be negotiated within the context of a conceptual framework consistent with reality. No system, in itself, is absolute.

Strategy selection for problem-solving can be obtained by observing how Nature applies and maintains principles and processes that correspond to viable ecosystems. In effect, the guiding principles for action in ecosystems should be designed in correspondence with those processes that have withstood the test of evolutionary time. The cycling of all material in Nature is just such a construct.

Prediction in ecosystems is difficult because the events and control mechanisms in Nature are not designed for that purpose. Natural processes have evolved because they provide the flexibility, feedback and sensitivity appropriate for the adaptation and responsiveness required for survival in a dynamic world. An ecosystems approach will reduce anxiety about decision-making in an uncertain future.

Simplified systems require greater control to maintain their viability - a form of babysitting. Ecosystems have a tolerance for disruption that corresponds to their evolution from a specific range of environmental parameters. Interference that occurs with an impact and/or time frame dissimilar from an ecosystems evolutionary background will require an increased amount of energy to maintain the same level of operation. Driving more energy through an ecosystem requires even greater control. There are definite limits to both the energy and the control required for maintenance and recovery of an ecosystem. Monoculture represents just such a simplified system.

Design Strategies for ecosystems.

Problem identification gets better as you are able to break out from the disciplinary and cultural filters that inhibit recognition of the real issues. Initial development of an holistic perception of a problem enhances the probability that the appropriate information will be considered thus improving the quality of decision-making.

Agreement in procedure rather than agreement in principle is a technique that should be adopted until communication and conciliation measures have been created. Attempts to resolve complex societal issues without first identifying the "rules of the game" and the underlying assumptions that map an ecosystems interactions, usually creates greater confusion about the issue.

Dynamic processes must be utilized that really incorporate what we learn along the way - feedback mechanisms that help to clarify complexity and aid in problem-solving and decision-making. Evaluation must be an ongoing process in any systemic effort.

Ecosystems stress occurs when ecological forces (not just biological) acquire a scale where feedback mechanisms are overridden and no longer provide the adjustments required for effective ecosystem viability. Recognition of this disruptive condition suggests the merit of early warning systems, shorter response time in systems, and sufficient slack to allow for flexibility in adapting.

The maintenance of systems integrity requires an ordering of relationships and perceptions that will provide patterns of component interaction. Discrimination among factors in a system is required for decision-making.

Intuition should be an integral aspect of any problem-solving process and techniques should be developed to make it more effective.

Educational programs should develop in such a way that they never become isolated from the systems that they are attempting to understand.

Reiterative processes are essential for effective problem-solving. Identification and comprehension evolve from the continual realignment of the perceptions and processes associated with the design of ecosystems.

Stability evolves from the availability of a diverse set of interactions relative to the pressures for change imposed from the en vironment.

Complexity is often confusing because we move through the system too fast - it becomes a blur. We need to slow down to comprehend what is happening in ecosystems.

Wrap Session.

The ecosystems approach is not intended as a device through which humans may attempt to subdue Nature, or to exalt it, but to come together in cooperation and coexistence. No systems approach is beyond reproach. An ecosystems approach can be misused and misinterpreted just as in any other technique through which we attempt to better understand Nature, including ourselves.

There is a richness in the patterns which emerge from the use of an ecosystems approach, and, by implication, an ingenious insight into complexity of whatever form. In this thesis a description has been given of the implementation aspects of an ecosystems approach. This description has utilized the Conservation of Natural Resources Program as a vehicle for the translation of the process into a practical context, but an ecosystems approach is also viable for understanding and resolving other complex issues.

"From a cosmic point of view, life has no value. It has meaning only to the degree that we endow it with decency, good will, the cultivation of beauty, and moral and intellectual values. If we define life by killing or dominating each other, we rob it of all value."

Albert Szent-Györgyi

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PART II

STRUCTURAL ASPECTS OF AN ECOSYSTEMS APPROACH

Introduction

In this part of the dissertation information is provided that demonstrates how the functional aspects of an ecosystems approach were employed in the CNR program. The structural properties of an ecosystem form a linkage that will:

- Reveal the character of an ecosystems approach.
- Corroborate the concepts and processes described in Part I and also allow for independent evaluation of their function.
- Exemplify the practicality of an ecosystems approach as applied in a real world situation.
- Reflect the spirit of the program as well as that of the participants.

The material in Part II was included to help clarify the themes and ideas of Part I. Most of the documents contained herein are not available in other publications and were included to provide a more comprehensive image of the character of the program. The reader is also given the opportunity to compare and contrast the interpretations made in Part I with the actual applications. It is also hoped that insights gleaned from this material may serve as a guide to the design and application of an ecosystems approach.

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Comprehensive list of information pertaining to the CNR program and available to anyone who might be interested.

SECTION A

THE ADMINISTRATIVE FRAMEWORK

OF THE CNR PROGRAM (1969-1972)

THE HISTORY

In the Fall quarter of 1969 the College of Agricultural Sciences and the School of Forestry and Conservation initiated an experimental field major called Conservation of Natural Resources (CNR). The new curriculum and it s courses have the following purposes:

1. Introducing students to the interdisciplinary nature of problems dealing with man's environment, including social-political-economic aspects as well as the physical and biological.

2. Involving the student directly in activities related to problem-solving in this broad field to provide a heightened awareness of the interdisciplinary nature of such activity.

3. Guiding the student in planning his University curriculum through intimate student-faculty contact and discussion groups, for a career either as a generalist with a wide spectrum of knowledge in the fields of "environment" and/or natural resources, or as a specialist in a related discipline.

4. Developing an interdisciplinary curriculum of sufficient scope and flexibility to provide a wide variety of possibilities in combining courses in the physical, biological, and social sciences and in the humanities to form a broad educational experience relevant to the solution of problems of the environment or of resource conservation.

The experimental courses and curriculum are now in their second year. Two committees are responsible for carrying out the program and implementing its objectives. The Innovative Course Planning Committee is charged with developing new courses and overseeing existing ones. The CNR Administrative Committee is responsible for the experimental curriculum and its requirements.

These committees are also the two formal avenues of student feedback in the program. The Innovative Course Planning Committee has 16 faculty members and 4 student members. The Administrative Committee has 6 faculty members and 5 student members. The student members on both committees are elected by the CNR students at an annual meeting.

Experimental Field Major in the Conservation of Natural Resources

Offered jointly by the College of Agricultural Sciences and the School of Forestry and Conservation beginning with the Winter Quarter (January 5, 1970). For information contact Office of the Dean, College of Agricultural Sciences, 101 Giannini Hall.

The major is designed for students motivated and concerned by public issues in the general field of renewable natural resources and who prefer a broader approach than the professional one or one based on a specific science. It provides undergraduate education focused on understanding man's environment, primarily from the viewpoint of people who will be urban dwellers, rather than direct participants in resource professions.

The major is designed to provide a framework within which faculty and students may work effectively to develop an academic approach to the conservation of natural resources. The major reflects an exploratory approach to the natural resource concept distinct from the management orientation of the existing major in the School of Forestry and Conservation and from the disciplinary orientation of the College of Agricultural Sciences. At the same time, advantage is taken of the interdisciplinary character of these units and of their facilities and faculties for instruction in Natural Resources.

The requirements of the Field Major, beyond the general University requirements, fall into three catagories which maximize to the fullest degree both flexibility and student choice.

I. The First Two Years (may include upper division work)

A. Three quarter courses are required in each of four of the five areas listed below.

B. Three additional quarter courses are required in one of the four areas chosen above.

C. Three quarter courses in Interdepartmental Studies designed for the major.

D. Two quarter courses in Reading and Composition.

The listed areas are: Humanities, Physical Sciences, Mathematics and Statistics, Social Sciences, and Biological Sciences.

These requirements for the first two years are designed to provide a breadth feature which is minimally restrictive, and to provide depth in one of the areas. Normally, but not necessarily, the remaining program in Conservation of Natural Resources will be based on the area of depth selected in the first two years. During this phase of the program, the student will choose his advisor in consultation with the Dean.

II. The Second Two Years

The student during this phase of his program is free to select his advisor from the faculty of the College of Agricultural Sciences or the School of Forestry and Conservation, wherever appropriate. In consultation with his advisor, the student will establish an "area of interest" in Conservation of Natural Resources. Ten courses in the area of interest are then required. The remainder of the program is elective. Work undertaken in the first two years may be offered in satisfaction of the ten course requirement. Similarly, whenever the student is qualified to undertake them, graduate courses may also be offered to satisfy the requirement.

III. Workshops (Taken for Credit)

A. Lower Division workshop. Each student in the major will be required to participate in a workshop of faculty and students, utilizing, where possible, weekends at off-campus locations. The primary aim of this workshop is not only to promote student-faculty discussions, but to assist the student in determining his area of interest. Indeed, the student's interest at this point may crystallize to the point that he will prefer one of the traditional majors in Agriculture or Forestry. The object is also to promote continuing re-examination of the work offered in the Interdepartmental Studies courses.

B. Upper Division Workshop. These required workshops will be organized group study courses. The object will be to provide for written and oral work in which the student integrates his accumulated experience in his area of interest in Natural Resources. These workshops will operate in the direction of developing an academic approach to natural resource conservation.

In summary, the curriculum derives its character and cohesiveness in two innovative ways:

1. The first year courses in Interdisciplinary Studies: "Man and His Environment - Crises and Conflicts." These courses present a variety of viewpoints concerning the current problems facing man who continues to exploit an already deteriorating environment. The ecosystem approach to understanding and solving the problems is the foundation of the courses. Students are thus brought immediately into the study of pressing contemporary problems which must otherwise be approached only in the upper or graduate divisions.

2. The workshops. The key element in the courses above and in the workshops is faculty involvement with students throughout the entire four years of study. This curriculum offers a continuing evolution of objectives developed by students and faculty in response to changing needs.

The program is experimental. After three years of operation, the Executive Committee of the College of Agricultural Sciences will restudy the operation of the curriculum and will report to the Faculty of the College and to the School of Forestry and Conservation on the desirability of its continuation.

Any student who is interested in such a major should contact the Office of the Dean, College of Agricultural Sciences, 101 Giannini Hall. We will be happy to talk to you personally and to explore how it may be tailored to your individual needs.

Appended is a list of courses presently offered on the campus which may be useful in considering the Field Major in Conservation of Natural Resources. It is in no sense intended as a list of "accpeted courses" and it may well be not at all inclusive. It provides, however, an illustration of the great diversity of relevant courses available.

THE PHILOSOPHY OF C.N.R.

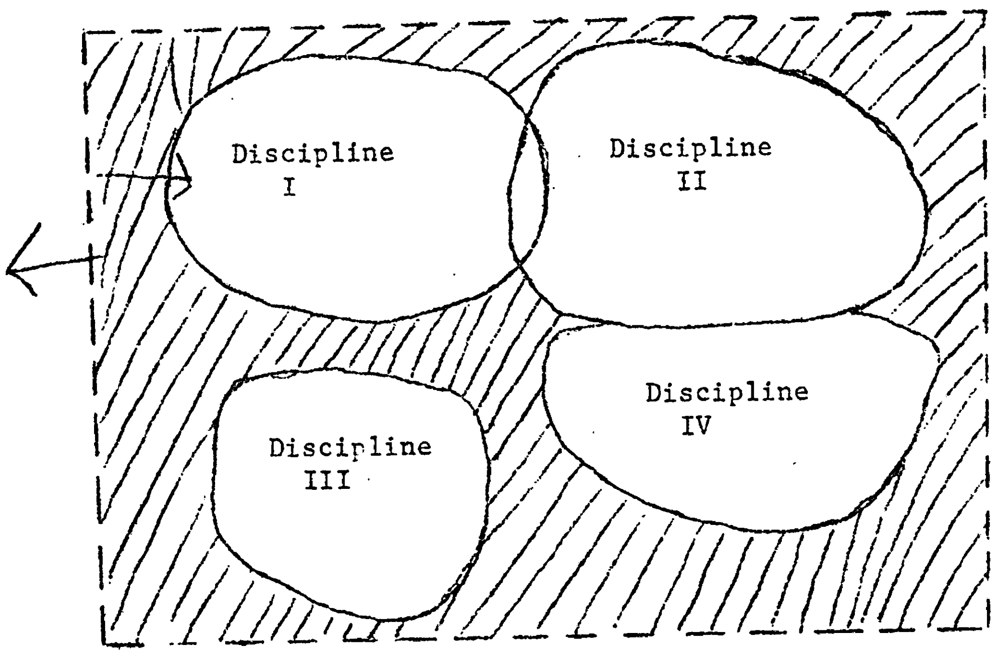
The CNR program is (1) interdisciplinary, (2) holistic, and (3) process rather than problem-oriented. All three of these distinguishing characteristics require that the major be highly flexible and individualistic for students.

No matter how defined elsewhere, for us interdisciplinarity means a coordination of several to many disciplines toward purposive goals. It is unlike a multidisciplinary program which requires simply a comprehension (mastery) of two or more fields.

The goals of an interdisciplinary program are derived from pragmatic (i.e., technological), social (i.e., normative) and ethical concerns in real world systems. They cannot just be studied as parallel empirical disciplines of, say, engineering, economics, or moral philosophy. One such goal, for example, might be determining the environmental impact of a proposed development plan for a particular ecosystem. Or, more generally, the writing of environmental impact statements for corporations or the public.

In the CNR program, the courses, subject matter, and domain of interest of every department (discipline) on campus is considered to be available and *a priori* equally relevant for an interdisciplinary curriculum. Although the program is administered by the College of Agricultural Sciences and the School of Forestry and Conservation, the fields represented by those two units are not considered to be dominating foci any more than sociology, public health, or any other important aspect of ecosystems. Only the individual student can determine what the focus is for him, or if indeed there should be one. It is for this reason that the courses designed in the CNR program specifically provide the opportunities for finding direction rather than giving direction per se.

It happens that the subject matter and domains of interest of the various disciplines on a campus come together at interfaces. Sometimes the disciplines overlap but more usually there is a "space" not handled conceptually or operationally by any of the adjacent fields.



Consequently there are elements, properties, and relationships which do not come under inquiry at all. It is precisely because these interfaces--with the disciplinary inclusions--have gone uninvestigated that we have what today is called an "environmental crisis."

Of course we know that nature "out there" is not fragmented into disciplines, nor is society (for those who feel that nature and society are mutually exclusive). However, academically we do not act as if we know it. This is why CNR espouses the study of whole chunks of nature rather than fragmented, morphologically perceived, isolated parts thereof.

These whole chunks are ecosystems. The wholeness view is called the holistic approach.

This does not mean that ecosystems are to be studied and managed as units without parts--only that at whatever level of resolution is appropriate, all of the systems parts are considered together. Thus in a system such as a forest, a holistic model might contain only five compartments: abiotic, soil, plants, animals, and man. Another model might subdivide the compartments into finer categories. No model is more holistic than another provided all the parts are included. The only difference is that at various levels of resolution, different qualities emerge. In fact it is these emergent properties which characterize the need for understanding whole systems. Frequently, reductionistic techniques of analysis remove or partially exclude these aspects and thereby significantly alter the nature of proposed "solutions".

The holistic framework of ecosystem study appears to be the only way out of a catastrophic situation which can be attributed to our dominantly reductionist or analytical modes of thought. Strategies and methodologies that stress synthesis (relations to the outside; purpose) and studies of wholes (input-output relations) are directions that students should take concurrent with the analytical (mechanism; internal functional relations). This approach involves not only a change in pedagogical techniques but drastic changes in our epistemology. For instance, how we think of time--cyclic time instead of linear progress; how we think of stability versus growth; how we accept the notion of complementarity; and so on.

Finally, the characteristic of process orientation,is perhaps the most important for CNR students. It was not very long before we recognized that the nature of all environmental problems is that they are far more complex and interrelated than previously thought. For example, the United States uses over 2 million chemicals while approximately 6,000 have actually been tested for carcinogenicity. Thus it becomes obvious that we cannot possibly deal with simplistic approaches in the hope that the "solutions" will not result in further problems. The answers cannot be found by simply recognizing a problem and finding a "solution." In addition, we could never find the time to identify, much less solve, all of the environmental situations that we are faced with now and in the future. Also, most environmental problems are recognized *ex post* and are often dealt with after they have gone beyond the critical zone for recovery (irreversible processes). We must find methods for *ex ante* identification and thereby provide *directions* for their resolution rather than attempting to find solutions.

With these reasons in mind we developed the technique of *systems thinking* as a process for environmental situation identification and resolution. This process basically requires one to regard *all* elements and relationships as being relevant, initially, to each situation. It is easily recognized that this infinite array of *things* cannot possibly be understood, much less effectively managed. Thus systems thinking is the process by which we reduce the number of variables to a more *realistic* amount. The term realistic would then apply to such items as the purpose for the study, the constraints imposed by time, knowledge and even money, etc. We can no longer afford the *a priori* elimination of any elements and relationships.

While systemic processes require involved techniques, a preliminary methodology may be stated here. The first priority is to develop a purposive, operational goal. The second step, then, is to identify the constraints under which the goal is reached. Since these constraints establish the boundaries around the system they must reflect the operational character of the selected goal. The process is reiterative which allows the goal to be modified to reflect the realism of the constraints identified. The third step requires identification of elements and relationships appropriate to the system under study. Only after these components are selected may the data be collected and synthesized for evaluation. The last stage is the selection of alternatives and analysis of the tradeoffs involved in the decision-making. This whole process is reiterative and provides a framework for looking at whole systems. It is not intended that this process provide other than opportunities for finding more appropriate directions for problem resolution. Significantly the method will greatly improve the probability of including more of the relevant variables while giving greater insight into the nature of whole systems processes.

This description of the process of systems thinking reemphasizes the interdisciplinary requirement of the CNR program. Goal identification cannot come from within an empirical field. Goals are suboptimal if generated by or for a part of a whole system. Normative goals are not "given" by technology and science nor are ethical goals "given" by normative policy. In each case the goals (or purpose) comes from above; that is, from the coordination of disciplines relevant to an ecosystem.

It is the philosophy of the CNR program that defining or identifying the goals of whole systems is equally if not more important than studying the workings of the parts. Essentially it is the formal inclusion of this feature in the students' curricula that sets CNR apart from disciplinary programs on campus.

While the level of resolution used here to describe the philosophy of the CNR major may not be adequate for complete understanding, it does provide the essential characteristics of our approach. It is certainly not without defect. In fact what we have is simply a positive direction but by no means a complete solution to our problems. Our attempt is to develop new and innovative perspectives for understanding and resolving complex and highly interrelated problems. This is why we are so insistent on flexability because it provides us with the continued opportunity for modification as we learn. This is why the administrative structure is so important and why we must constantly reflect on our progress and never stagnate with our success. The reiterative process is important because the major itself is a systemic whole systems approach.

The following courses of study were actually completed by five CNR majors. Because the requirements of the curriculum are minimal, each of our students has an "individual" major. We hope though that these examples will give you an idea of the depth and breadth of the students' interests.

Example 1

First two years

Physical Sciences:
Astronomy 1a - Introduction to General Astronomy
Chemistry 1a - General Chemistry
Chemistry 1a - General Chemistry
Chemistry 8a - Survey of Organic Chemistry
Physics 4a - Physics for Scientists and Engineers
Physics 4b - Physics for Scientists and Engineers

Mathematics and Statistics:
Engineering 1 - Computers and their Applications
Mathematics 11a - Calculus
Mathematics 11b - Calculus

Humanities:
Spanish 1 - Elementary Spanish
Spanish 2 - Elementary Spanish
English 43 - Introduction to the Study of Poetry

Biological Sciences:
Biology 1a - General Biology
Biology 1b - General Biology
Biology 1c - General Biology

CNR courses:
Interdepartmental Studies (IDS) 10a - Man and His Environment
IDS 10b - Man and His Environment
IDS 10c - Man and His Environment
IDS 49 - Introduction to CNR

Other:
Rhetoric 1a - Introduction to Speech
Rhetoric 1b - Introduction to Speech
History 4c - European History and Civilization
Philosophy 25c - Modern Philosophy to Kant
Political Science 2 - Introduction to Politics

Second two years

Area of Interest:
Botany 154 - Plant Ecology
Forestry 123a - Physiological Plant Ecology
Forestry 173 - Field Course in Wildlife Biology
Geography 130a - Natural Resources and Population
Geography 130b - Open Land as a Natural Resource
IDS 170 - Wildlife Biology and Management
Zoology 107a - Natural History of Vertebrates
Zoology 107b - Natural History of Vertebrates

Example 2

First two years

Biological Sciences:
Biology 11a - Introduction to the Science of Living Organisms
Biology 11b - Introduction to the Science of Living Organisms
Biology 11c - Introduction to the Science of Living Organisms
Botany 5 - Introduction to Botany
Paleontology 1 - Introduction to Paleontology
Zoology 4 - Animal Biology

Humanities:
Art 136 a - Art of India
Art 150a - Medieval Art
Near Eastern Languages 121c - Modern Indian Literature

Social Sciences:
Anthropology 2a - Introduction to Archaeology
History 150a - Medieval England
Near Eastern Languages 1a - Elementary HinduUrdu

Physical Sciences:
Chemistry 1a - General Chemistry
Chemistry 1b - General Chemistry
Geology 5 - Geophysics and the Earth

CNR courses:
IDS 10a - Man and His Environment
IDS 10b - Man and His Environment
IDS 10c - Man and His Environment
IDS 49 - Introduction to CNR

Other:
English 1a - First-Year Reading and Composition
English 1b - First-Year Reading and Composition
Spanish 1 - Elementary Spanish
Spanish 2 - Elementary Spanish
Spanish 3 - Elementary Spanish

Second two years

Area of Interest:
Genetics 100 - General Genetics
IDS 100 - Problems in Marine Biology
Zoology 108a - Invertebrate Zoology
Zoology 108b - Invertebrate Zoology
Zoology 110a - Cytology
Zoology 110b - Cytology
Zoology 110l - Cytology Labratory

Electives:
Art 136b - Art of India
Psychology 110b - Introduction to Biological Psychology

Example 3

First two years

Humanities:
French 5a - Advanced French
French 5b - Advanced French
French 33a - Survey of French Literature
French 33b - Survey of French Literature
French 101 - Intensive Reading, Grammar and Composition
French 102 - Intensive Reading, Grammar and Composition

Social Sciences:
Political Science 1 - Introduction to Politics
Political Science 2 - Introduction to Politics
Sociology 10 - Introduction to Sociology

Biological Sciences:
Botany 10 - Plant Botany
Physiology 10 - Biology of Man
Zoology 10 - Animal Biology

Physical Sciences:
Astronomy 1 - Introduction to General Astronomy
Engineering 148 - Introduction to Information Processing
Physics 10 - Descriptive Introduction to Physics

CNR courses:
IDS 10a - Man and His Environment
IDS 10b - Man and His Environment
IDS 10c - Man and His Environment
IDS 49- Introduction to CNR

Other:
Speech 1a - Introduction to Speech
Speech 1b - Introduction to Speech
Anthropology 1 - Introduction to Physical Anthropology
History 4d - European History and Civilization
Philosophy 4 - Introduction to Philosophy: Theory of Knowledge

Second two years

Area of Interest:
Anthropology 140 - Nature of Culture: Intorduction to Cultural Anthropology
Anthropology 148 - Man's Ecological Relationships
Biology 150 - General Ecology
Environmental Design 110 - Introduction to City Planning
Geography 130a - Natural Resources and Population
Geography 130b - Open Land as a Natural Resource
Plant Pathology 198 - Independent Study
Psychology 160 - Social Psychology
Sociology 150 - Human Migration
Sociology 160 - Urban Sociology and Ecology

Electives:
Criminology 191a - Minority Groups and Crime

Example 4

First two years

Social Sciences:
Agricultural Economics 112b - Rural Sociology
Criminology 100 - Introduction to Criminology
Psychology 101 - Fundamentals of Psychology
Psychology 102 - Principles of Psychology
Sociology 200 - Population and Society
Sociology SS-Sc - Deviations in Society

Biological Sciences:
Biology 100 - Principles of Biology
Biology EXT. X403 - Onshore Marine Life at Monterey Bay
Plant Pathology 199 - Independent Study (Herbicides in S.E. Asia)

Humanities:
English 103 - Literature of the Western World
History 101 - Western Civilization I
History 102 - Western Civilization II

Physical Sciences:
Anthropology 100 - Introduction to Physiological Anthropology
Physical Sciences 134 - Principles of Physical Sciences
Statistics 100 - Probability and Statistics

CNR courses:
IDS 10a - Man and His Environment
IDS 10b - Man and His Environment
IDS 10c - Man and His Environment
IDS 49 - Introduction to CNR

Other:
Economics 101 - Economic Analysis and Economic Policy
English 100 - Expository Writing
History 222 - United States: 1865- Present
Rhetoric 1b - Introduction to Speech

Second two years

Area of Interest:
Agricultural Economics 112a - Rural Sociology
Anthropology 148 - Man's Ecological Relationships
Anthropology SS-SC - Peoples and Cultures of S.E. Asia
Forestry 116 - Recreational Use of Forests and Wildlands
Geography 130a - Natural Resources and Population
Plant Pathology 199 - Independent Study (Ecology of Viet Nam)
Psychology 199 - Independent Study
Sociology 160 - Urban Sociology and Ecology

Example 5

First two years

Humanities:
Art - Watercolors
Art 121 - Design
Education - Elements of Music
Humanities 110 - General Humanities
Radio - Creative Writing
Radio - Telecomunications

Physical Sciences:
Physics 6b - Introduction to Physics
Physics 6c - Introduction to Physics
Physics 120 - Intermediate Physics

Mathematics and Statistics:
Architecture 198-2 - Computer Science
Mathematics 1a - Calculus
Mathematics 16b - Analytic Geometry and Calculus

Social Sciences:
Education 198 - Independent Study
Philosophy 130 - Logical Philosophy
Psychology 120 - Human Thought

CNR courses:
IDS 10a - Man and His Environment
IDS 10b - Man and His Environment
IDS 10c - Man and His Environment
IDS 49 - Introduction to CNR

Other:
English 1a - First-Year Reading and Composition
English 1b - First-Year Reading and Composition
Architecture 121 - Construction Systems and Production
History 17b - United States
History 17c - United States

Second two years

Area of Interest:
Architecture 101 - Social and Behavioral Considerations in Design
Architecture 102a - Structure and Production as Form Determinants
Architecture 102b - Physical Environment as an Arch. Determinant
Architecture 102c - Synthesis of Determinants of Arch. Design
Architecture 191c - Civil Engineering
Architecture 198 - Independent Study (Earth Day)
Education 197 - Independent Study (Thousand Oaks)
Landscape Architecture 199 - Independent Study (Thousand Oaks)
Landscape Architecture 199 - Independent Study (Nature Area)
Civil Engineering 125 - Structural Systems

ADVISING IN C.N.R.

Advising is probably the most critical area in the CNR Major and yet in some ways it is currently the weakest area. Hours and hours have been devoted to discussing the courses, the requirements--but to date comparatively little time has been spent defining the role of the advisor, the goal and the mechanics of advising. What follows are some suggestions for philosophy and procedures for advising. We hope to have your help in preparing a more formal statement of advising policy prior to the College Faculty Meeting in December. To that end we present these suggestions to work from. We would like you to give CNR advising some serious consideration and to give us your thoughts on it as early as possible.

Philosophy: Because CNR has few explicit requirements, the faculty advisor has a more important as well as a more challenging and interesting role than that of advisors in other, more structured majors. CNR does have, however, implicit requirements. The breadth requirement is designed to allow the student an opportunity to explore the many areas of knowledge available at the University. The IDS 10 series will present to him the many facets of the environmental crises and put this in the perspective of the systems approach. He will become aware of the need for interdisciplinarity in attacking many environmental problems. In CNR 49 the student will exchange ideas with other students and faculty and begin to find direction for his future education.

The advisor's most difficult tasks begin when the advisee begins to plan the area of interest. The timing of this will vary with each student. The area of interest is the least explicitly defined requirement in the major. It is probably goal-oriented, process-oriented and interdisciplinary. It is essential that the student understands why the courses he has chosen for the area of interest are appropriate to it. The student should be allowed maximum freedom in developing an area of interest, but the advisor should evaluate the credibility of every course offered in satisfaction of this requirement. Once a program of study is established the student should be held to it unless he can justify changes. The advisor should be flexible here, but still firm. The 10 courses in the area of interest is the CNR equivalent of the upper division requirements in a traditional major. When the student has designed his course of study he should be able to defend it as vigorously as a traditional major could be defended. If this process is carried through, CNR 149, where the student attempts to look at his education synthetically, becomes much more valuable.

Mechanics: Keep records on your students. Advisors should have a s separate folder for each student they are advising. Any materials dealing with education before CNR are permanently on file with the undergraduate secretaries (Lillian Walter, Forestry; Nel-Margaret Howell, Agriculture). They will be happy to duplicate any part of their files for your records and the offices will try to forward student records to you as soon as they receive them.

Beginning with Fall 1972, each new student entering the major will be required to write an essay on why they have chosen CNR. This will be forwarded to the advisor for inclusion in the file.

Try to get the student to put things in writing. This is especially important when the student is about to start the area of interest. Writing things down usually focuses the student's interest and causes him to really think about why he is planning a certain course of action. One technique is to get the student to define the area of interest and then pick 20 courses that might be used to reach the goal he has set. The advisor then might choose 20 courses he thinks would be relevant to the area of interest. In a discussion on the comparison of the two lists the student will begin to refine his choice and more explicitly define the importance of each one. When the student begins the area of interest he should offer a description of what it is to be-preferably in writing. He should choose 10-15 courses and justify in writing the inclusion of each one in the area of interest (see sample attached).

The intent here is not to rigidify the student's program, but to find ways to get him to seriously consider every aspect of his education. Many of our most successful students are entirely self-motivated. They do go through the above thought processes without a lot of encouragement from an advisor. The advisor's difficult task lies with those students who need a lot of direction in this process.

Making Contact with the Students: The most common complaint of advisors is "My students only come to see me when they want their study list signed." The most common complaint of students is "I can never find my advisor." Make sure you are available to your students. Either keep regular office hours or give your students some way of getting in touch with you to make an appointment. (By the way, your department offices are often very vague about where you are and when you will be back.) Availability is especially important during the first weeks of the quarter, through the week of study list filing.

Make it clear to your students that you want to see them at times other than study list filing. This could be either during office hours or in a more informal setting. Follow up if the student doesn't come in. The CNR Office would be happy to help you send notes in the middle of the quarter telling recalcitrant students to come by and see you.

If a student consistently refuses to establish any relationship with an advisor, perhaps he should be encouraged to think about transfering to a major which relies less heavily on advising.

Other Thoughts: Be familiar with the course catalogue. Try to get an idea of what courses in every department would be germane to CNR.

Get to know the other advisors. One good way to do this is to spend a little time in the CNR Office. Many advisors drop in for coffee and it is a good place to meet them.

If you feel that you are doing an inadequate job with one of your advisees, try to steer him to an advisor with more appropriate expertise.

How the Student Finds an Advisor: All new students are interviewed by the CNR secretary who gives them the names of 2-3 advisors whose interests are appropriate to the student's educational goals. Ideally the student then "interviews" the advisors and chooses one he thinks would be most compatible with his interests. The advisor has the right to refuse a student if the advisor's work load is already too great or if he doesn't feel comfortable with the student, etc. The students are allowed (but not encouraged) to change advisors after the initial selection. A change is usually the result of changing interest on the part of the student or the development of a personality conflict.

New Developments: Beginning this Fall an Advisors Coordinating Committee will be available to help you. The three members of the committee will be able to answer your questions as they arise and help you with any problems you encounter. Please take advantage of this resource.

It is obvious that CNR demands a great deal of its advisors--both in time and in thought. You should in turn demand a great deal of your students. Most will be happy to have the challenge.

ROLE OF ADVISORS IN THE CNR PROGRAM

Advisors play a key role in the academic lives of students. This is particularly true with regard to the CNR program in which students literally build their own curricula around a minimum core of program requirements.

The flexibility of the CNR program is its greatest strength, but also a potential course of weakness. It is the advisor who ensures that each student's program is educationally sound and meets the CNR Major's standards of intellectual rigor. This requires that each advisor be familiar with both the philosophy and objectives of the major as well as with the mechanics of implementing it.

To be effective in the special kinds of advising required by the CNR Major, advisors should take special care to be open and sensitive to each individual student's particular educational needs. In many cases these needs cannot be readily defined and require catalyzing. In all dealings, the advisor should remember that the CNR program is not oriented to developing specific problem-solving technicians in the traditional sense. Rather, the student's program should be process directed aimed at systemic thinking, and interdisciplinary in nature.

Specifically, the advisor is the official deputy of the Chairman of the CNR Experimental Field Major in all academic matters affecting the student. The advisor's role includes the following:

1. Assist students in selecting a program of study leading towards a bachelor's degree. Supply information to the student on objectives of the CNR Major, the development of an appropriate curriculum, the selection of appropriate courses and all procedural details.

2. Consider petitions for waiver of requirements and admission to the major.

3. Determine the applicability of work completed at other institutions to the CNR requirements.

4. Maintain records of academic program.

5. Supply information requested by the Chairman regarding student work and progress.

6. Assist the Chairman in effecting regulations applying to the CNR program and in the maintenance of acceptable scholastic performance.

7. Approve programs of study. The advisor's signature on study lists is the only signature required by the Chairman as indicating official approval. Students must confer with their advisors at the beginning of each quarter and at other times during the quarter as is appropriate.

To be effective, each advisor must keep regular office hours. Students are dependent on the advisor for advice and frequently cannot act without the advisor's signature on a number of forms. To ensure the best possible advising, cooperation and understanding are essential. Advisors are urged to maximize their contacts with advisees through shared coffee breaks, luncheon appointments, field trips, home visits or other means.

SOME UNIFORM ADVISING PROCEDURES

Require student to write a short statement (letter of intent) describing educational goals. This will require the student to give some mature thinking to goals and purpose before seeing an advisor.

In consultation with the advisor the student must:

A. In the Freshman and Sophomore Years

1. Identify the 4 breadth requirement areas.

2. Schedule a) the IDS 10 courses
   b) Subject A and reading and composition courses
   c) CNR 49
   d) University requirements of American History and American Institutions.

3. Discuss general areas of major interest. Continually up-date as educational goals are re-defined.

B. In the Junior and Senior Years

1. Solidify area of interest.

2. Schedule a series of basic core courses representing this interest with special attention to pre-requisites and required sequences.

3. Schedule CNR 149.

4. Keep track of requirements for graduation.

Requirements for the Degree of Bachelor of Science in Conservation of Natural Resources

The Degree of Bachelor of Science is awarded those candidates who:

1. Satisfy the General University requirements:

   a. Subject A (see page 22 of General Catalogue)

   b. American History and American Institutions (see page 23 of the General Catalogue)

   c. Are registered in the University during the senior or final year (3 quarters) in the College or School of the University in which the degree is to be taken (College of Agricultural Sciences or School of Forestry and Conservation). (See page 22 of the General Catalogue)

   d. Attain at least a "C" average on all courses taken for a letter grade at the University.

   e. File notice for candidacy at the time of filing the study list in the final quarter.

2. Satisfy the general requirements of the College of Agricultural Sciences or the School of Forestry & Conservation:

   a. Complete at least 180 quarter units (either by letter grades or P grades). Not more than 6 quarter units may be in lower division PE courses.

   b. At least 54 units must be in upper division courses (courses numbered 100-199). Graduate courses may be used for this purpose with the approval of the advisor.

3. Satisfy the requirements of the CNR major:

   a. Students in the College of Agricultural Sciences must submit to Mrs. Howell a CNR degree checklist (green sheet) with the advisor's certification that the CNR requirements have been met. This should be done early in the final quarter.

   b. Advisors who are advising CNR students in the School of Forestry & Conservation should consult Mrs. Walter regarding degree checks for these students.

BREADTH REQUIREMENT

"Three quarter courses in 4 out of the following 5 areas, plus three additional courses in one of the areas chosen, are required: Biological Sciences, Physical Sciences, Social Sciences, Humanities, and Mathematics & Statistics. The most commonly asked question about this requirement is how do you define biological science, social science, etc. This is not an easy task. We do not mean that in order to fulfill a requirement in physical science that a student must take Chemistry or Physics! The test should be on the content of the course rather than the title or department. Thus, many geology and geography courses are physical sciences. Ask yourself what is the basic view of the course of the phenomena under study. This is usually a simple way to determine what classification the course should fall under. Thus Physical Anthropology (Anthro 1) deals with physiology and evolution and its explanation of the material is biological. Therefore it is a biological science. Cultural Anthropology (Anthro 3) deals with social behavior and is therefore a social science. Archeology (Anthro 2), although it contains elements of chemistry and physics, uses archeological data to try to reconstruct social phenomena, therefore, it too is a social science.

INTERDEPARTMENTAL STUDIES

"Three quarter courses in Interdepartmental Studies designed for the major are required." At the moment the only "Interdepartmental Studies" courses designed for the major are IDS 10 A, B & C. However, since this requirement was written before we were able to offer "Conservation of Natural Resources" courses, it is likely that the requirement will be changed to allow students to use those courses as well as IDS courses.

READING AND COMPOSITION

"Two quarter courses in reading and composition are required." English 1AB, Comparative Literature 1AB and Rhetoric 1AB are the courses usually used to fulfill this requirement. If a student wishes to use some other course here at Berkeley, or if there is a question about courses at a previous school, consult Dean Middlekauff or Dean Teeguarden.

CONSERVATION OF NATURAL RESOURCES 49

As you know, we no longer require junior level transfers to take this course. But, all students entering the major with less than 90 units must take it or have it waived by special petition. We would like to encourage all students to take the course and to do so as soon as they enter the major.

AREA OF INTEREST

A student MAY NOT start the area of interest until he is a junior (90 units). He MAY include lower division course taken while a junior or senior in the ten courses which constitute the area of interest. This pair of rules seems odd, but it was felt that there might be cases where a lower division course was properly part of the area of interest (rather than preparation for it) and the student should be allowed to include it.

Many people, both students and faculty, have confused the lower division breadth areas with the area of interest. In "dividing human knowledge into five areas" for the purpose of the breadth requirement it was not the intent to imply that a student was limited to one of them in his area of interest. One of these classical disciplines might indeed be emphasized in the area of interest, but a student should be encouraged to cross disciplinary boundaries when it is necessary. If the student's educational goals are better served by a traditional major then he should be encouraged to change to that major. Thus a student whose area of interest was forestry or biology might be encouraged to change, while a student whose area was Forest Recreation or Technology and Its Effect on Biological Feedback Mechanisms probably belongs in CNR. This latter area of interest might include courses in Zoology, Biology, Electrical Engineering and Computer Science, History, and Sociology. A course should be used as part of the area of interest when it makes sense in relation to the area under study.

CONSERVATION OF NATURAL RESOURCES 149

See enclosed history.

AMERICAN HISTORY AND INSTITUTIONS

The American History and Institutions requirement is a University requirement. It can be fulfilled in several ways (see page 23 in the current catalogue). A student who fulfills this requirement through course work may apply those courses to any of the CNR requirements as well.

AREA OF INTEREST

Advising a student who is trying to determine his or her "area of interest" is often the most difficult task facing an advisor.

The area of interest is formally defined as a package of ten courses which CNR majors must take during their junior and senior years. The courses are usually upper division yet lower division and graduate courses taken by students while they are juniors or seniors may be acceptable. None of the 10 courses may be taken while the student is a freshman or a sophomore. These courses must give the student a greater depth of knowledge in their area of interest. The area of interest (comprised of the ten courses) must serve to fulfill one or more of several possible goals: 1) an intellectual goal to satisfy a desire to learn for learning's sake; 2) to qualify for graduate training; 3) to gain employment.

The ten course package is always interdisciplinary and each student may take courses from any of the departments and colleges throughout the campus if such courses are relevant to his area of interest. Because of the diversity of courses and interests and flexibility of the major, it is doubtful that any two students would take the same courses even though their areas of interest are defined in similar terms. For these same reasons of diversity in courses and student interests, the degree of resolution of the area of interest is left to the student and his or her advisor. It may be defined as broadly as "natural history" or be as restricted as biochemistry or molecular biology.

A student should determine his area of interest with the advisor acting as a sounding board for the student's ideas. Once the student has decided his area of interest then he should know why he is taking each of the ten courses and be able to defend this choice of courses. The advisor must also evaluate each course to determine if it is appropriate to the student's goals. Advisors must require each student in writing to 1) define the area of interest and 2) defend his choice of courses to fulfill the area of interest. The major purpose of requiring this written statement is to aid the student in formulating his ideas into an area of interest. It should be emphasized that this written statement does not preclude a student from changing his area of interest as his ideas change and his goals become clarified. It should also be emphasized that the student must not be held to precedented areas of interest but should be free to create and define his own in his own terms. If the student can justify a course of action rationally, he should be allowed to follow it.

EXPERIMENTAL FIELD MAJOR IN CONSERVATION OF NATURAL RESOURCES
DEGREE CHECKLIST

Student: ______________________________

Advisor: ______________________________

University Requirements (check when fulfilled):

( ) Subject A ( ) American History ( ) American Institutions

CNR Requirements:

FRESHMAN AND SOPHOMORE YEARS (The following to be started but not necessarily completed during the first two years)

I. Three quarter-courses in four of the following five areas are required: Biological Sciences, Social Sciences, Physical Sciences, Humanities, Mathematics and Statistics. Three additional courses in one of the areas chosen are also required.

SIX QUARTER-COURSES IN ______________________________

Department	Number	Name of Course	Units	Qtr., Yr.	Where Taken

THREE QUARTER-COURSES IN ______________________________

Department	Number	Name of Course	Units	Qtr., Yr.	Where Taken

THREE QUARTER-COURSES IN ______________________________

Department	Number	Name of Course	Units	Qtr., Yr.	Where Taken

Student: ____________________

THREE QUARTER-COURSES IN ____________________

Department	Number	Name of Course	Units	Qtr., Yr.	Where Taken

It is strongly recommended that the student include Biological Sciences as one of the four areas chosen above.

II. Two quarter courses from the Interdepartmental Studies 10 series and one additional quarter course approved for the major by the Advisory Committee are required.

IDS					
IDS					

III. Two quarter-courses in reading and composition are required.

(The above courses <u>may not</u> be taken on a P/NP basis.)

IV. Lower-division seminar in Conservation of Natural Resources.

CNR	49	Introduction to CNR	2		U. C. B.

(The above course is recommended but not required for those students who enter the major as juniors or seniors.)

V. Other courses completed as a freshman or sophomore.

Department	Number	Name of Course	Units	Qtr., Yr.	Where Taken

CNR DEGREE CHECKLIST
Page 3

Student: ____________________

Department	Number	Name of Course	Units	Qtr., Yr.	Where Taken

JUNIOR AND SENIOR YEARS

VI. Ten courses in an "area of interest" are required. Work undertaken in the first two years MAY NOT be offered in satisfaction of this requirement. However, lower-division and graduate courses taken as a junior or senior may be acceptable.

AREA OF INTEREST

VII. Senior seminar in Conservation of Natural Resources.

CNR	149	Senior seminar in Natural Resources	4		U. C. B.

VIII. Other courses completed as a junior or senior.

Department	Number	Name of Course	Units	Qtr., Yr.	Where Taken

CNR DEGREE CHECKLIST
Page 4

Student: ______________________

Department	Number	Name of Course	Units	Qtr., Yr.	Where Taken

Courses taken to fulfill the American History and American Institutions requirement may also be applied to any CNR requirement. A student must complete 180 quarter units in order to graduate, 54 of which must be upper division units. No more that 1/3 of the units taken between Fall Quarter, 1970 and the date of graduation may be taken on a Pass/Not Pass basis. Only 6 units of lower-division P.E. will be counted toward graduation.

his is to certify that ______________________, upon satisfactory ompletion of his/her current program, will have met the requirements of the .N.R. Major and will be eligible for the B.S. degree at the end of the current uarter.

______________ Date

______________________ Advisor's Signature

Thoughts on Advising
from Loren Cole,
CNR Administrative Associate

Because of the individualization that is an inherent part of the major, it is very difficult to provide generalizations which would apply equally to all students. Even though the orientation and goals of each student are different, there are common threads in the major that should be an integral part of each student's education.

The uniqueness of the major can not be explained in one sentence nor in one paragraph, in fact it can best be understood through actual participation in the teaching and interaction that is constantly occurring in the CNR office. The one outstanding characteristic of the program that distinguishes it from any other environmental program in the country is that it is process-directed rather than problem-directed. This distinguishing feature is not a semantic one. Some programs explicitly desire to train people to solve specific environmental problems (i.e, a water pollution control technician). This is not our purpose. This particular example would be the province of a discipline such as chemistry or sanitary engineering or possible public health. Students in CNR should be more holistic and systemic in their educational goals. Any interdisciplinary program essentially provides students with the opportunity to look at the interfaces between disciplines. As such the goal chosen by the student should reflect the recognition of these interfaces. Using the above case as an example again, a CNR student might have as his education goal "to provide (develop) environmental monitoring techniques for water pollution in estuaries." This assumed goal recognizes the system under study and is educationally operational because it provides some boundaries within which the student can identify the interfaces deemed relevant. The goal itself may not be as explicitly defined as above but the advisor's role is to provide the feedback necessary for the student to understand the reasons why they are looking at the particular interfaces they have chosen.

The first two years of the major are specifically designed to allow students the opportunity to recognize the infinite array of interfaces possible before selecting their educational direction. CNR 49 is designed primarily to give students the opportunity to find direction for themselves in the major. Additional benefits are provided by the close interaction between faculty and students, and between students and students, as well as between the group and their environment. The field trip format is simply the best way to facilitate these objectives. I would encourage all advisors to teach CNR 49 at least once every two years.

The advising role in this program is certainly a difficult one to play. The diversity of student interests and time demands place an unusual burden on the faculty. This is not without rewards. Vice-Chancellor Mark Christensen recently told the entering freshman during orientation that CNR was one of the best programs on the campus for freshmen. We have and are continuing to receive laudets from agencies, organizations (public and private), all the way from the U.S. Forest Service, to Dames and Moore in Ohio, to the Berkeley City Council. Our graduates are getting good jobs and the field is opening up for them in all areas.

Many techniques exist for advising in the CNR program. Many of these you will have to innovate yourself, others have been tried and work well with some students. In particular advisors should never coerce but should guide. They should not constrain but should help the student try to understand the course of action that has been chosen. If students do not have an explicit understanding of their goal or do not even have "good" reasons for taking a particular course but still insist that they want to - - then they should be allowed to do so. We have discovered that the most unusual courses act as a catalyst for synthesis. The University per se is not designed to look at whole systems nor is it inherently capable of synthesizing information after it has been taken apart by the various disciplines. It is difficult to define exactly what processes are required to put information back together. We do know, however, that students will flounder around in their education with no understandable purpose and then take a course in something (sculpture perhaps) which somehow provides them with a direction. (In the sculpture case it was environmental law.)

Students need feedback. Since the whole campus is open to them it is extremely difficult for them to determine if they have chosen correctly. (Not in your minds, but in theirs.) To provide this feedback one must be <u>open</u> and sensitive to the students. By this we mean the student should feel comfortable around you and willing to take advantage of your experience and advice. Ask the students to have coffee with you and set a date. Have lunch with one of your advisees or with all of them encourage; them to communicate with you by being more specific as to time and place. The general comment that your door is always open usually isn't enough. If you are going out on a field trip and have extra room, invite the students to come along. Make your presence (and thus your interest and concern) more generally known by frequenting the CNR office once or twice a month for coffee, etc. You may wish to host a business friend or member of the faculty in your home and can invite your students (and others when possible). This isn't a comprehensive list and certainly you know better the kind of things that you would feel more comfortable in. The whole idea is to really be an advisor and not simply someone who signs the student's study list. The students are and probably will continue to be remiss in their responsibilities, but that should not be an excuse for laxity on the part of the advisor.

RESOURCES AVAILABLE IN THE C.N.R. OFFICE

1. LIBRARY: A small but high quality library including many books too recent to be in the University Library system. Books are available for two week loan to faculty or students.

2. INFORMATION FILE: A fairly comprehensive file of environmental topics containing every thing from newspaper clippings to research papers. Available for office use.

3. PAMPHLET LIBRARY: A wide collection of pamphlets and newsletters ranging from the "Freedom News" to the Metropolitan Life "Statistical Bulletin". Available for office use.

4. TAPE LIBRARY: A small tape library consisting primarily of IDS 10 lectures. This library will be expanded enormously in 1972-1973.

5. STUDENT PROJECT FILE: The better papers from IDS 10 have been catalogued and cross-indexed by subject. The projects vary in quality and usefulness but many are very good and cover a large number of topics. (List by subject enclosed)

6. INTERNSHIP REPORTS: The papers of the experimental internships of 1971-1972 are catalogued and available for office use.

7. FACULTY RESOURCE FILE: A large number of departments have been surveyed and the interests and expertise of their faculty indexed. The file concentrates on faculty with interests in environmental problems and is arranged both by department and topic. The faculty members included have indicated whether or not they are willing to sponsor student research. This constantly expanding file should be useful to both you and your students.

8. PROGRAMS AT OTHER SCHOOLS: A small file containing information on environmental programs at other colleges and universities.

9. U.C. BERKELEY-OTHER MAJORS: We are currently collecting information on all the other undergraduate programs here a" Berkeley. The file emphasizes information not available in the General Catalogue or the bulletins of the Schools and Colleges.

10. MEDIA: A limited number of media items-some posters, a few slides, a large number of photographs. We have one film, "Pave It and Paint It Green", dealing with Yosemite Valley (no narration). This film is useful at most audience levels including K-12.

11. <u>EQUIPMENT</u>: We now have some equipments available for use:

A. A sony stereo taperecorder that is transportable (but not easily portable).

B. A sony cassette tape record.

C. Four walkie-talkies for field trips.

D. A complete Hach soil and water engineering.

12. <u>HUMAN RESOURCE FILE</u>: A file of on and off campus contacts for lectures, seminars, etc.

13. <u>BULLETIN BOARDS</u>: 4 bulletin boards in the hall outside the CNR Office have announcements of campus events, new courses, jobs, student news, current crises, etc.

Note: All of the above Resources are available to faculty and students (CNR and other). Some will be checked out to faculty only.

Office of the Conservation of Natural
Resources Experimental Curriculum

12 May 1972

MINUTES OF THE MEETING OF THE CNR ADMINISTRATIVE COMMITTEE
8 MAY 1972

Present: R. Norgaard, D. Wood, R. Diamant, D. Holmes, M. Walraven, J. Hagerty, R. Lilley

Guests: L. Cole, R. Arkley, D. Tyler, F. Cobb, S. Akeson

Absent: W. Middlekauff, A. Schultz, D. Teeguarden

D. Holmes presented a proposed description of the CNR Major prepared by several students. This description follows the format of the one currently found on page 21 of the College of Agricultural Sciences bulletin.

Proposed new description:

CURRICULUM IN THE CONSERVATION OF NATURAL RESOURCES

Administered by an interdepartmental committee of the College of Agricultural Sciences and the School of Forestry and Conservation. Chairman of the Committee: David L. Wood, PhD, Professor of Entomology, 125 Giannini Hall.

This major is for innovative students desiring an opportunity to explore both original and traditional approaches to issues in areas of interaction between population, natural resources, and the environment. The flexibility of this curriculum allows a student to draw upon the wide range of academic resources on the Berkeley campus and the community. In addition, there is an expanding range of courses which provide sources for individual motivation and innovation in seeking interdisciplinary solutions to resource problems. Communication and personal interaction with faculty members and other students is a basis from which the students develop an expanding awareness of their self-determined direction.

F. Cobb noted that a redefinition of the major may be affected by the information obtained from granting agencies recently visited in Washington, D.C. by several of our faculty. D. Wood appointed R. Norgaard, D. Holmes, and M. Walraven as a subcommittee to interview the group who went to Washington, and to present their findings at the meeting of the week of 22 May.

The Committee attempted to define some "common threads" in the CNR Major. The following were proposed:

1. Holistic and systems thinking.
2. Emphasis on environmental (ecosystem) understanding.

3. Flexibility (to specialize or generalize) (to choose what "level of resolution" the student wants to use to look at problems).
4. Students are able to question both content and theory.
5. Synthesis.
6. Interdisciplinary approach.
   a. Interactive process
   b. Goal formation

R. Diamant noted that most of the above concepts form an approach to education (or a meta-structure) which may not be limited to the CNR Major--but rather which are a larger educational process we can use to reflect the concerns of the major.

D. Wood argued that the Committee must come to grips with the content important to the Major. The Committee must attempt to define that which is relevant to the major and that which is not.

D. Tyler proposed the following definition of "systems thinking", a concept the Committee seemed to agree was not only part of the meta-structure but was also part of the content of the major.

> Systems thinking is an explicit recognition of the interaction of elements in a system at the level examined, and how those interactions are ramified both upward and downward in levels of organization and resolution.

The Committee agreed that the presentation of systems thinking now used is inadequate. Two solutions seem to be available:
1. A restructuring of the IDS 10 series
2. A new course for CNR majors, specifically on systems thinking

It was agreed that the Committee will meet weekly until the end of the quarter. The next meeting will be Tuesday, 16 May at 12:00 Noon in Room 133 Giannini Hall.

Office of the Conservation of Natural
Resources Experimental Curriculum

18 July 1972

MINUTES OF THE MEETING OF THE C.N.R. ADMINISTRATIVE COMMITTEE --16 May 1972

I. The meeting began with a discussion of what differentiates CNR from other programs. What, it was asked, is the "definition" of the major?

A. M. Walraven felt that it was dangerous to try to define such a young major. Current trends, said he, may not be viable in the near future. The major shouldbe flexible enough to adapt to the changing needs of its students.

B. R. Norgaard asked whether freedom is enough to constitute a major. W. Libby commented that founders of CNR did not want it to become a home for those who did not fit elsewhere. They had hoped a much narrower group of students would be attracted. However, he also pointed out that the founding faculty did not want to define the curriculum themselves as they felt they did not have enough "education" in the field to do so.

II Common Thread of the Major was then discussed.

A. With only one exception, the student members of the committee felt that systems thinking did form a common thread in the major, although it was not always explicitly taught.

B. R. Arkley felt that systems thinking should be emphasized by the advisors as well as by the courses. He feels that the advisors should be better educated in this area. In addition, a systems course which emphasized expanding boundaries and exponential growth in complexity would allow students to put any course into the perspective of "where are the boundaries drawn?"

III The current CNR program and its various elements were then discussed. What functions might some of the elements/courses perform?

A.

Part of Program	Possible Function (s)
1. IDS 10	Eco-systems introduction, Systems thinking, Holism
2. CNR 49	Introduction to major and opportunity to find direction
3. CNR 149	Synthesis of individual programs.
4. Breadth requirements	Recognition of possible interfaces.
5. Field of Interest	Synthesis of purpose.

B. What part do advisors play? It was generally agreed that advisors are the key to success, and that both they and the students should be adequately informed of their role.

MINUTES OF THE MEETING OF THE C.N.R. ADMINISTRATIVE COMMITTEE--24 May 1972

I. The meeting was concerned with the possibl. and methods of the teaching of systems thinking.

A. There was some discussion of systems thinking vs. systems analysis. A. Schultz stated that the former was synthetic and systems analysis applicable than systems analysis.

II. Loren Cole proposed that IDS 10 be changed to a one quarter, 15-unit course, which would immerse the student in systems thinking, both theoretical and applied to specific problems. During the discussion of this proposal the following objections were voiced:

1. A 15-unit course would not serve the entire campus community as IDS 10 now does.
2. The course might change the kind of student who enters CNR---many now come in after exposure to one quarter of IDS 10.
3. Perhaps 49 and 149 should be sacrificed for a more intensive course for CNR majors.

III Although the committee agreed that IDS 10 should be reorganized and that systems thinking should be more rigorously taught in CNR, no decision was made on methods to achieve these goals.

July 20, 1972

MEMO

To: All faculty involved and interested in the CNR program

From: Loren Cole, Administrative Associate of CNR

Re: Current Status and Plans

My apologies for the somewhat ineffective communications system that frequently leaves you wondering what's going on here in the CNR office. We are currently in the process of re-defining the direction for IDS 10 and instituting the various alterations approved by the major's Administrative Committee for our other courses. Presently we are:

1) Rewriting the history and philosophy of CNR for purposes of grant-writing, advising, and communication.

2) Organizing IDS 10 ABC as IDS 10 A, 10 B, and 10 S. The latter will be a seminar (no lectures) series utilizing group case-study workshops to implement the processes taught in 10 A and 10 B. In the academic year 1973-4, we will be readjusting our program for this series by teaching the pre-requisite IDS 10 in the winter quarter and 10 S in Spring. Another innovation, IDS 110, a course to be offered for 15 units credit in the fall of the same year, will be planned during the coming year to fascilitate the need for intensive education in the systems process and ecosystem understanding. More later about that.

3) Formalizing the already-proven-successful internship program---a 15 unit course designed to give students a practical educational experience in the real world. Students in the program work for various real-world agencies and organizations, and independent of the agency, expand their knowledge of the field by reading and research. Project reports from the 14 students who were interns this past year are available in the CNR office for examination, and most are really quite thorough.

4) Hopefully formalizing the extremely successful "Urban Garden Ecosystems" course taught this past spring quarter by Profs. Raabe and Vlamis and Williams, with Associate Bill Olkowski and assisted by Helga Olkowski. A brief brochure concerning the framework and content of the course is available in our office. We also might suggest that those interested visit the garden in the NW corner of Oxford Tract---very worthwhile.

5) CNR 49 and 149: Although we are modifying their directions all the time, these two courses are still the key classes for the major. Requirements for the program, they have done a fine job of stringing together the rest of the CNR program for the students. (The rest of the campus should initiate them as well.) Background information and student papers from these seminars are also available in the CNR office.

6) New courses desired and in need of some design and planning help (in close association with interested students):

a) History and Philosophy of Conservation: Of immediate need. One quarter trial under Herb Gold indicates potential is there.

b) Environmental Chemistry: Possible potential within limits of available resources. Genuine student demand. Certainly could provide direction for Chemistry Dept. if CNR were unable to handle it on a long-term basis.

c) Environmental Law: Evaluation of biological principles and concepts related to legal aspects of problem-solving. Good demand from students---possibly could be a joint effort with

Boalt Law School or Environmental Design. Needs discussing. Community lawyers are interested and available .

d) Environmental Case-study Seminar: In conjunction with Business and Industry---faculty and students will deal systemically with (a) real industry problem(s). Would provide insight into scope of elements and relationships inherent in correcting environmental problems. Industry interested and available. Environmental Information Clearinghouse will help coordinate.

7) IDS 120, Environmental Education: will be holding small faculty seminars to discuss directions and organization for coming year. New faculty welcome. The activities book is published and available in CNR. Also, information pertaining to the course structure and actual operation.

8) Grant-writing teams have been formed but we are in need of persons who are willing to offer time and services. Grant possibilities are available with NSF and other agencies and foundations.

The CNR program has already utilized the faculty resourcesof over 43 departments on the Berkeley Campus and the resources of over 100 community organizations, businesses, and governmental agencies. With our 210 students vigorously pursuing their educational objectives, the program continues to operate below its potential. Money is certainly a concern(FTE's are obstacles, but faculty are the cornerstones). Help is always welcomed, and, as you well know, essential to our well-being. Some of our students design their own courses and initiate their own grant proposals (successfully!); resources are necessary to provide these creative individuals with guidance and enthusiasm. If you can deal with flexability, experimentalism, enthusiasm, innovation---and don't mind being tremendously overworked---we need you! Come into the CNR office, 33 Giannini Hall, and acquaint yourself with the program while we get acquainted. Even if you are presently unable to actively participate in the program, we would appreciate your lending us your experience and your ideas---we need those, too!

One of our working CNR mottos---one that keeps us optimistic when times get rough and money short---is a rule of the Bombay, India Golf Club: "You must play the ball from where the monkey drops it." Please...come in and play ball!

Loren Cole

PS!!! There will be an advisors' meeting on Wednesday, September 6, from 10 am- 1 pm, in 103 Mulford Hall. All CNR advisors, please RSVP with us at 2-6730! Anyone interested in becoming an advisor for the major is warmly invited to attend.

ADVISORS COORDINATING COMMITTEE

MINUTES OF THE MEETING OF 18 SEPTEMBER 1972

Present: F. Cobb, Chairman
J. Helms
J. Laing
P. Gersper, ex-officio

The meeting opened with a short discussion of the current state of advising in CNR:

(1) We have 25 advisors
(2) Many of them are overloaded
(3) Advising techniques, and indeed advice, is not uniform

The Committee then discussed the recruitment of new advisors:

(1) P.L. Gersper has been recruiting new advisors from those faculty who have participated in CNR in some way
(2) The committee discussed the number of advisors needed
(3) The committee began discussion of what criteria, if any, should be used in recruiting new advisors

P.L. Gersper explained the makeup of the new CNR committees: Advisory; Course Planning and Development; Advisors Coordinating Committee. In addition to the members present at this initial meeting of the Advisors Coordinating Committee, the Committee will have 3 student members and 3 more ex-officio members: the chairmen of the other committees and Loren Cole. There was some discussion as to whether such a large committee could be efficient.

The new committees have not been given specific charges and it will be a duty of each committee to develop its own charge.

The Committee then went on to a discussion of immediate and long term priorities. Topics discussed were:

(1) Preparation of a handbook for advisors which would establish uniform procedures for advisors.
(2) Preparation of a contribution on advising to an informational booklet on CNR to be presented at the College Faculty meeting this Fall.
(3) Establishment of criteria for acceptance of intra-campus transfer students. Selection of a committee of advisors who will handle interviewing and acceptance.
(4) Preparation of a hand-out for new students advising them of the procedures they must go through on entering the major. Possible expansion of this to a "contract" the student will sign on entering the major which will indicate his willingness to fulfill certain administrative procedures.
(5) Establishment of a method and specific techniques for orienting any CNR advisors.
(6) Developing a charge for the Committee.

Immediate priorities are developing "Steps for New Students" (No. 4 above) and orienting any new advisors who will be advising in Fall 1971.

CONSERVATION OF NATURAL RESOURCES FIELD MAJOR MARCH 16, 1971

THE C.N.R. NEWS

POLICY AND PURPOSE OF THE CNR NEWS

Purpose:

To get the CNR majors in communication with one another, and thus to facilitate cooperation and a feeling of togetherness. This is your major. We feel that only by working together can we begin to solve the problems facing us in the university and the total biosphere.

Newsletter Policy:

Anyone can contribute articles to this newsletter. We would prefer them typewritten and double-spaced. Bring articles to our box in 33 Giannini.

We will work on setting up a calendar of all activities which may be of interest to CNR students. If you know of any activities please let us know.

The present staff is headed by Rolf Diamant (editor) 549-0643. The staff includes many contributing editors and is open to all CNR majors and interested students. Anyone wishing to get involved should contact Rolf.

If any urgent news comes up, it can be communicated to all CNR majors by way of the Phone Chain, which is headed by Mike Walraven 453-4725. Contact Mike or leave word at 33 Giannini if something important comes up.

Publication:

We would like to put out a publication at least once every other week.

It is expensive in terms of money and time to mail out to each CNR major. Therefore, the newsletter will be available in 33 Giannini for you to pick up. If it is impossible for you to pick up the newsletter, leave your name and address in the newsletter's box at 33 Giannini and you can receive the newsletter in the mail.

****

Now is your chance to get involved. The CNR major will only be effective, if and when, you support and create its activities. We appreciate any suggestions, opinions or help you give us. Drop by 33 Giannini.

FLASH!!!!!!!!!!!! IMPORTANT********************CNR STUDENTS MEETING

A meeting for all CNR Students will be held in 101 Biochemistry, Tuesday, March 30, 1971 at 7:30 P.M. If you have any ideas about the direction you would like to see the major take, or any other ideas you would like others to know about, be sure to come and share them.

WHERE HAVE ALL THE PROJECTS GONE ?

What happens to the undreds of student IDS 10 projects each quarter after they have been handed in and graded? They are being recycled. Now don't get excited all you erstwhile environmental scholars, they haven't gone the way of old newspapers and glass bottles yet! All the old projects are being "recycled" in different sense, IDS reports from the last four quarters are currently being reread and indexed in preparation for filing in the Agriculture Library, in Giannini Hall.

The completion of this gargentuan task will make an immense quantity of environmental research on a wide spectrum of subjects, easily available to individuals and groups inside and outside the university. Projects deal with such topics as population control, coastline development, recycling, nuclear energy, rapid transportation, sewage treatment, ecological teaching, Strawberry Creek, Pup Fish, Southern Crossing, Lake Tahoe, California Water Plan, Noise in Berkeley, Nuitrition, San Francisco Skyline, Wild Rivers, Smog, Fire Conservation . . . just to name a few. If you can think of it, it is there, (including essays, poems, and photography). The A.S.U.C.s' lobbyist in Sacramento, Richard Twohy, has urgently requested IDS to send much of this environmental research to him and his staff. Plans are being made also to publish excerpts from certain projects in a new ecology column in the Daily Californian.

The indexing of the projects is expected to be completed in the first few weeks of Spring Quarter when they will all be filed and made available to everyone in the Agriculture Library. But much work still remains to be done. If you are interested in helping or would just like to rap, call Rolf at 549-0643.

WHAT DO THE NATIONAL ENVIRONMENTAL POLICY ACT AND C.N.R. MAJORS HAVE IN COMMON ??????

The National Environmental Policy Act Says in section 103: "The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and (2) all agencies in the Federal Government shall -

(a) Utilize a <u>systematic, interdisciplinary approach</u> which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment."

This has profound implications for CNR majors with respect to jobs with the federal government. It also gives moral support to the generalists among us - you are and will be needed. Perhaps in a nutshell, section A says what CNR is all about.

EDUCATION - FORESTRY 198

There's a joint Education - Forestry 198 being offered next quarter which is going to do some research to find out what is available to CNR majors after they graduate. We're going to contact business and graduate schools and find out what their requirements for entrance are. This information will be fed back into CNR, in the form of a catalogue of programs and their entrance requirements, and in the form of recommendations for the future development of this major.

It's a three unit course, which will consist of letter-mailing this quarter and information cataloging, etc. next quarter (Spring). The class will meet once a week on Wednesdays from 1-3 to organize and pool information. It's being sponsored by Don Erman in Forestry and David Miller in Education.

If you're interested, contact

Steve Akeson (ph. 841-1262)

Don Erman (ph. 642-5285; rm. 21 Mulford)

ANNOUNCEMENTS

Scott Nearing author of Living the Good Life will speak on Friday, March 19 7:00 - 10 P.M. in 100 HARMON GYM.

C.N.R. Office needs your art work . . . Photos, Collages, Weaving, etc. Items can be donated or lent. Bring to rm. 33 Giannini or call Kathy Ohlson - 843-9384.

Anyone interested in working on environmental education at the John F. Kennedy High School in Richmond, contact Jon Standing - 642-3582.

URGENT C.N.R. QUESTIONNAIRE

At the CNR meeting of Thrusday, February 25th, many people expressed an interest to get together with the other people in the major with common interests. Please answer the following questions and return to the CNR office (33 Giannini). Thank you.

1. Year in school:
2. Planned Date of Graduation:
3. Area of Emphasis:
4. What do you plan to do after graduation?
5. What are the ten courses which make up the core of your curriculum?
6. What projects, clubs, activities, are you involved in?
7. What do you do in your leisure time (hobbies, sports, etc.)?

Name ______________________________

Address ____________________________

Phone ______________________________

STUDENTS in the CONSERVATION of NATURAL RESOURCES FIELD MAJOR
College of Agricultural Sciences

WINTER QUARTER 1970

Total enrollment: 103 (most transferred from Letters and Science)

Freshmen: 24 (24%) Sophomores: 29 (28%) Juniors: 41 (40%)
Seniors: 8 (8%) Limited status: 1

March 1970

40 CNR honor students (79 in the College as a whole)

5 CNR students on probation (3 made good standing by the end of Spring)

SPRING QUARTER 1970

Total enrollment: 122

Freshman: 26 (21%) Sophomores: 36 (30%) Juniors: 52 (43%)
Seniors: 8 (6%)

29 New Students: Transfers from Letters and Science: 26
Transfers from other four year schools: 2
Transfers from junior colleges: 1

10 Students left CNR (reasons other than graduation)*

June 1970

51 CNR honor students (97 in the College as a whole)

4 CNR students on probation (3 made good standing by the end of Fall)

SUMMER SESSION 1970

2 CNR students graduated

FALL QUARTER 1970

Total enrollment: 146

Freshman: 14 (9%) Sophomores: 35 (23%) Juniors: 56 (39%)
Seniors: 41 (29%)

36 New Students: Transfers from other colleges, U.C. Berkeley: 17
Transfers from other four year schools: 6
Transfers from junior colleges: 8
Admitted for second Bachelor's: 1
Readmitted to College of Agricultural Sciences: 4

10 Students left CNR (reasons other than graduation)

December 1970

3 CNR students graduated

52 CNR honor students (111 in the College as a whole)

no CNR students on probation

*Indicates students who were enrolled the previous quarter but who failed to enroll the quarter in question.

WINTER QUARTER 1971

Total enrollment: 160

Freshman: 16 (10%) Sophomores: 41 (25%) Juniors: 55 (35%)
Seniors: 48 (30%)

29 New Students: Transfers from Letters and Science: 19
Transfers from Engineering: 1
Transfers from other four year schools: 3
Transfers from junior colleges: 2
New Freshmen: 1
Admitted for second Bachelor's: 1
Readmitted to College of Agricultural Sciences: 4

12 students left CNR (reasons other than graduation)

March 1971

3 CNR students graduated (one with honors)

67 CNR honor students (143 in the College as a whole)

3 CNR students on probation

SPRING QUARTER 1971

Total enrollment: 162

Freshman: 16 (10%) Sophomores: 40 (24%) Juniors: 63 (39%)
Seniors: 43 (27%)

24 New Students: Transfers from Letters and Science: 17
Transfers from other four year schools: 2
Admitted for second Bachelor's: 1
Readmitted to College of Agricultural Sciences: 4

19 CNR students left (reasons other than graduation)

June 1971

17 CNR students are candidates for the B.S. degree in June. Of these, two may graduate with honors and two with highest honors.

STUDENTS in the CONSERVATION of NATURAL RESOURCES FIELD MAJOR
School of Forestry and Conservation

WINTER QUARTER 1970

Total enrollment: 5 (all transfers from Letters and Science)

March 1970

1 CNR honor student

SPRING QUARTER 1970

Total enrollment: 7

2 New Students: 1 transfer from CNR, College of Agricultural Sciences
1 admitted as concurrent major with Psychology

June 1970

1 CNR honor student

1 CNR student on probation

FALL QUARTER 1970

Total enrollment: 7

1 New Student: transfer from Cal State Hayward

1 Student withdrew

WINTER QUARTER 1971

Total enrollment: 6

1 Student withdrew

March 1971

1 student on honor roll

SPRING QUARTER 1971

Total enrollment: 6

1 Student readmitted to Forestry and Conservation, CNR

1 Student transferred to Letters and Science, Geography

June 1971

2 students will graduate in June

All other CNR students in the School of Forestry and Conservation are expected to graduate Summer or Fall 1971.

SECTION B

DESCRIPTIONS OF MAJOR COURSES AND PROJECTS IN CNR PROGRAM

IDS 10

In the past, problems have been solved by studying different aspects of them, separated from the whole. It has become obvious that we cannot solve the environmental problems by using this method. We do need specialists and we realize that there exists a critical need for specialists in the appropriate disciplines. But long term solutions will require more than this. We need generalists and synthesizers: people who can understand and communicate the implications inherent in any environmental decision or action.

Courses introducing the student to the interdisciplinary nature of environmental problem-solving should begin no later than the student's freshman year in college. During the first year three broad possibilities are opened to the student: He may decide to become a generalist and orient his education that way. He may decide to become a specialist, and deal with a limited number of aspects of the ecological crisis in depth. Or he may select some other occupational speciality entirely. But no matter which, he will leave the course with some understanding of the interrelated nature of environmental problems.

While our program is not meant to transcend all of the problems associated with interdisciplinary studies, nor to provide a panacea for all of our problems, we hope the direction we are taking will provide new insights into problem-solving. The analogy of emergent quality resulting from the combination of hydrogen and oxygen to form water is appropriate here. The ability to transcend the conceptual differences between disciplines will provide some emergent qualities to deal with environmental problems in the broadest context.

We can classify what we attempt to do in IDS 10 under the following headings:

STIMULATION AWARENESS DIRECTION SYNTHESIS

Since the environmental crises manifest themselves in a large number of areas we provide students with ideas and opinions from a variety of disciplines. The lectures do not attempt to give in-depth analysis of any particular aspect of the crises but attempt a detailed overview of the crises from a variety of specialities. The way the material is presented is instrumental in both awareness and stimulation. The subject matter covered depends upon the available teaching resources (both on and off campus). How they are used depends on what motivates the students.

It is broad concepts which are important in IDS 10. Informational content is not intended as a primary goal except as a means to achieve the other objectives. This does not mean that we disregard the importance of information for students. Rather we wish to stimulate students into pursuing a particular subject elsewhere in the University. We cannot provide in-depth coverage with the time we have available. The proper place for deeper penetration is either in student projects or in other classes on campus.

The most important and significant aspect of the course is the discussion section. They are intended to provide the interchange and dialogue that imparts continuity to the course. An Associate and a Faculty member act as moderators, discussion directors and information sources in each section of 15-20 students. The size and format of the sections provide close communication and awareness among the Associates, Faculty and students.

In each section the student works on a project which accounts for 60% of his grade. These projects help give the direction he needs. The students are encouraged (but not required) to do action projects, preferably in a group. Students are allowed a maximum amount of freedom to pursue projects which are of interest to them: to help write, change, enforce, or inform others about certain laws, to start recycling projects or clean a creek, to do an attitude survey useful to government or industry, to do sculpture, posters, film, or other media to help communicate concern, awareness or some information to the public. In short, to attempt some real world problem-solving, something seldom encouraged at the undergraduate level.

The freedom of choice provides the educational experience of choosing a particular topic from a near-infinite set of topics. By this the student learns to weight his past experience and knowledge and establish priorities for his time and energy. The group is now the real world framework for problem solving. Within the goal-oriented group the student learns to appreciate and accomodate the personality and communicative difficulties encountered in this situation.

One of the innovative aspects of these projects is that the student is allowed to fail. The student may run into some brick wall which frustrates his original intent. With good direction from his section moderator he can understand the reasons for his failure: Was it a lack of information? The wrong method? Was his goal too broad? A full understanding of difficulties and reasons for failure will provide relevance and guidance for the rest of his education by illuminating the importance of statistics, biology and economics, etc. The importance of the social and cultural characteristics, as well as the scientific, need to be emphasized if the proper problem-solving perspective is to be obtained.

Many of our students have already been involved in environmental action outside the University setting. Some of them have already learned the value of academic learning in solving real world problems. These students are encouraged to spend their project time doing in-depth research in areas of interest to them.

Relevance

The relevance of a program like this is important enough to discuss further. Students today, and in particular at the University of California, are not entirely motivated by the usual criteria. That is, by degrees, job possiblities, money, position, etc. As a result the student finds it difficult to identify his goals with those of many courses. Courses like IDS 10 provide direction for the student. Other courses which he might not have taken become an important part of his curriculum. This will be expecially true in the natural and life sciences but does not exclude other disciplines. We have been able, within just one year, to see significant interest and measureable increase in courses within the College of Agricultural Sciences, the School of Forestry and Conservation, as well as in other science courses such as chemistry, zoology, biology, and some engineering offerings. Significantly, our feedback from students and faculty alike is overwhelming in its praise of the course as one of the most important ever attended. The response from students finds fault only with some lack of continuity and with some specific lecturers. We are attempting to correct these problems. Without question our flexibility allows easy adjustment in terms of content as new information becomes available.

Field Trips

An important part of the IDS 10 program, as well as the two other IDS courses described here, is the use of field trips. When properly handled, the field trip is one of our most effective teaching techniques. It provides the student with some insights into real-world processes and increases his understanding of the nature and difficulty of problem-solving. In addition, the field trips develop a camaraderie between students and faculty which breaks down the barriers that naturally occur when people with a variety of viewpoints look at the same problem.

The field trips taken vary from tours of P.G.&E. facilities to bicycle tours of urban areas to U.S. Forest Service areas. The purpose of the trip should correspond with student interests in the section. The trip will increase student awareness and provide direction and provide a framework for both their IDS 10 projects and other classes at the University.

Faculty Participation

A significant innovation of the program is the nature of faculty participation. Each section has one faculty member in it who acts as a resource and as a catalyst for discussion. Presently faculty participation is accomplished by invitation of selected faculty members from all disciplines with an unusually good response because they are relieved of administrative chores by the associate in the section. Most faculty participants feel that the sections have been a learning experience for them as well as for the students. Many of our faculty participants come from departments which normally have little contact with lower-division students.

SUMMARY STATEMENT
IDS 10A FALL 1970

James E. Pepper, Teaching Associate

Any position rests on assumptions. The basic premise of this paper is the assumption that the continued survival of man is desirable. This may not be demonstrably objective, but certainly a viewpoint most men are willing to accept and strive for.

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IDS 10 was first offered on the UC Berkeley Campus in the fall of 1969 under the course title Man and His Environment. One year later the possessive pronoun was dropped in an attempt to break free from the homocentric bias and the course became Man and Environment. Ideally still a further revision is needed; the substitution of the preposition In for the conjunction And--for we are in fact Man in Environment.

Why the fuss over a course title; why not just get on with the business of "education"? I suggest these subtle revisions are extremely important for they illustrate a changing perspective and the resultant perceptions of the man-nature relationship.

We often describe IDS 10 as an "environmental problem-solving" course. Splendid. But I am compelled to interject a note of caution: the identification of a problem is likely to determine the nature of the solution, and a shift in our man-nature perspective quite naturally calls for a redefinition of problems. Man and His Environment implies man's relationship to environment is one of ownership or possession; Man and Environment does not imply any relationship between the entities; Man in Environment provides a realistic context. Without belaboring a point, each perspective will define problems differently and I am convinced, arrive at radically different solutions.

These three perspectives suggest parallel real world cases: (a) Man viewing the environment as a PRIVATE RESOURCE, (b) Man viewing environment as a COMMON RESOURCE, and (c) Man viewing environment not as a "resource", but as a HABITAT.

Two fundamental concepts underlie the preceding discussion:

(1) The position, perspective or perceptions of an observer determines his definition of a problem.
(2) The nature of problem identification predetermines the nature of its solution.

By considering the environment as our habitat, the natural sciences can be brought to bear in determining the impact of habitat manipulation relative to the biological survival of its species complement.

At this point it is imperative that we make a distinction between biological and "cultural" survival. It is my contention that biological survival is prerequisite for cultural (social-economic-political) survival. Therefore let us proceed on the strength of this contention and examine two basic mechanisms involved in biological survival. (Noting carefully that this is not a scientific dissertation and is intended to serve as a conceptual reference only.)

(1) Basic habitat determinants of survival.
- (a) Availability of external energy (solar radiation).
- (b) Availability of life support mediums (e.g. for man: air, water, land).
- (c) Availability of metabolic energy source (food).

(2) Species internal determinants of survival.
- (a) Migration (move)
- (b) Evolution (change or adapt)
- (c) Resignation (extinction) (not exactly survival)

Our internal determinants provide little choice. A mass exodus from the planet seems highly unlikely, thus removing the first alternative. There are those who argue for the third alternative on the grounds that the phenomenon of life is better off without its "most advanced" species and that the life force on the planet cannot survive with man. While this provides an intriguing insight and criticism of man's past behavior, it does not allow for any significant future adjustment in our behavior patterns; nor is it consistent with the basic premise of this paper. Furthermore this option might be deemed extremely dangerous on the grounds that it increases the likelihood that in presuming to resign our own fate we will include the rest of the biosphere. Thus, our process of elimination yields but one avenue for survival; evolve; change; adapt.

The context for evolution is the habitat or environment and any adaptation must compliment the habitat determinants if the habitat is to continue to sustain its component species. Logically we must next develop a means to examine the behavior of our habitat--the environment. This initial quarter of IDS 10 was designed to equip us with such a framework. A number of basic concepts or principles have been presented in the lecture series and supplemented with your particular outside readings. For sake of reference only the most important concepts/principles are listed below, realizing an understanding of these is paramount in dealing with man in environment:

(1) Ecosystem
(2) Holism
(3) Systems thinking (approach)
(4) Food webs/chains
(5) Energy flow (ecological energetics)
(6) Homeostasis
(7) Stability--diversity
(8) Dynamic stability (or equalibrium)
(9) Reversibility--irreversibility
(10) Regenerative--nonregenerative
(11) Biogeochemical cycles

Unfortunately no such list is ever "complete", but I feel the following additions are imperative:

(12) Symbiosis
(13) Parasitism
(14) Commensalism
(15) Mutualism
(16) Feedback (positive and negative)
(17) Interdependence

Dictionary definitions have obvious limitations but the following such definitions should provide a foundation for your own operational use of the terms.

Symbiosis: the living together of two dissimilar organisms especially when this association is mutually beneficial.

Parasitism: a relation between organisms in which one lives as a parasite on another. (parasite: living off another without any useful return)

Commensalism: living with, on, or in another without injury to either.

Mutualism: a relationship between two species of organisms in which both benefit from the association.

Feedback: knowledge of the results of any behavior considered an influencing or modifying further performance of the organism. (positive reinforces; negative corrects)

I have purposely omitted any discussion of environmental management or manipulation (pesticides, air pollution, etc.) in hopes that a new perspective of the man-environment relationship can be achieved through a more thorough understanding of the behavior of the natural systems. Rational environmental management should result from such an understanding.

Man has a propensity to simplify the complex. This is not only true with theory but in fact is consistent with his behavior within our earth habitat. The environmental crisis is the extension of our single purpose short range simple problem-solution perspective. By reconsidering the entire planet as man's habitat a simple conclusion is reached; man shares this habitat with the entire constellation of life and is inextricably bound to a common destiny--survival. By posing yet another rather innocent exercise, still a further sobering reality emerges.

(1) List those life forms which depend on man for their continued survival.
(2) List those life forms upon which man depends for his continued survival.

I suspect the first list is relatively short and consists mainly of domesticated animals--but the second is undoubtedly diverse in composition and unlimited in length.

Man stands atop a pyramid of life. In our contemporary form we appear wholly convinced of the assets of this position yet miserably inept at recognizing the magnitude of the liabilities. I am convinced that the present order of man's dominance is a relatively recent development in the context of historical time. Prior to this era, man undoubtedly played a dominant role in determining the "state" of the environment, but necessarily limited by natural constraints.

We are well versed when called upon to discuss the effects of medicine, pesticides modern agricultural technology (etc.) on population growth during the past 100 years. We are likewise aware of the "benefits" of our technologies, as well as the horrifying inequities in the distribution of these "benefits." But most alarming is our lack of knowledge of the impact of technology on the stability of the life pyramid. Should we manage to innocently or inadvertently destroy or oversimplify and seriously weaken any substantial portion of the structure upon which we are wholly dependent, biological repercussions would be felt throughout the ecosystem, ultimately resting upon man himself.

I believe we have the mandate for a new perspective. A perspective which evaluates technology as pro-life or anti-life, not merely from our present egocentric viewpoint. We must develop measures of the impact of technology on the environment and prepare to abandon those which are overtly anti-life.

It is highly unlikely that we can evolve biologically at a rate comparable to our present rate of environmental modification. This imposes severe restrictions on our alternatives: a concept of self control must replace our urge for environmental control. Our priorities must undergo drastic revision: pro-human bias must become a pro-life bias. And by viewing life as a continuous dynamic process with its stewardship entrusted to man, perhaps we can recapture a sense of purpose, meaning and hope, conspicuously absent in our contemporary lives.

Office of the Conservation of
Natural Resources Experimental
Curriculum
33 Giannini Hall
14 July 1971

To: Everyone interested in IDS 10

From: Loren Cole, Administrative Associate, IDS 10

Re: IDS 10 Planning Meeting

It is difficult to write a coherent account of our IDS 10 planning meeting at Arnold Schultz's house. 25 people attented and the discussion was spirited--often 5 or 6 people trying to make a point at once. To make the meeting more manageable we spent most of the day in three smaller groups. The first question to which we addressed ourselves was--What are the purposes and objectives of IDS 10? What is its role given the awareness and state of the world over the past two years? Previously our goals were stimulation, awareness, direction and synthesis and we wanted to know whether these objectives should be continued, altered or completely changed. The consensus seems to be that we should abandon the goals of stimulation and awareness and reinforce and enhance the aspects of direction and synthesis. Our three groups came up with the following possible goals and purposes for the course:

<u>Group 1</u> A. Presentation of ecological principles and processes, and the development of a bio-ethic.

B. Comprehensive viewpoints of environmental situations (in order to recognize conflicts and crises).

C. An attempt to understand the root cause(s) which lead to environmental crises and conflicts.

D. Creation of an environment which facilitates the synthesis of alternative directions which lead to modification or restructuring of the root causes in order to correct the dislocation between the ideal bioethical view and the present reality.

<u>Group 2</u> Purpose: To conduct and inquiry into the alternatives and consequences of human action with reference to an evolving bio-ethic.

A Bio-ethic is a set of principles based on values derived from a creative analysis and synthesis of the best available knowledge.

Goal: To make the students conscious of their potential for self-renewel. Self-renewel defined as: ability to create one's own values,ability to engage in rational, creative action.

<u>Group 3</u> To develop in students the intellectual skills to enable them to engage in rational, creative action in a systems context which allows the student to identify the sensitive control nexus, and in a framework of a positive bioethic.

Bioethic--a system of values derived from the assumption of the inherent wisdom of evolved biological relationships in providing long-term support systems on this planet.

Our discussion of possible structures to achieve our redefined goals had less concrete results. However, there was general agreement on some policies:

1. That IDS 10 is a three quarter series and does and should form a somewhat unified course of study. Students who enter the course in the middle of the year are at a disadvantage, but we have not yet attempted to deal with this problem in an innovative way. Therefore, we will not as yet require the course to be taken as a series, but will attempt to solve the problem by other methods. Two suggestions are:

A. At the end of each quarter a syllabus of the essential information from the lectures will be prepared. New students entering the following quarter will be required to acquire the syllabus and to demonstrate to the satisfaction of their associate that they have mastered the material. In addition, tapes of all lectures will be available in the language lab for students to review.

B. Some sections will be predesignated as "beginning" sections and new students would be required to take these.

2. That there is a body of knowledge which should be communicated to the students and this consists (in part) of the systems approach and of bioethics (which includes basic ecological principles).

3. That the major learning in the course has always been in sections and projects while the major planning attempts have been in the lectures. There should be more planning and structure (guidelines) in the sections and projects.

4. Since it has been difficult to relate the sections and projects to the lectures of the past two years, the lectures should be changed to present material which can be readily utilized in a variety of sections and projects.

Our approach for the past two years has been to present students with freedom and some information and to leave it to individual associates and faculty members to provide direction for the freedom and a framework for the information. Many of the students are simply confused by this, so we mush change. Hopefully, the lectures will provide some of the framework next year. We will devote later meetings to some discussion of teaching techniques that have proved successful, thoughts on guidelines for successful projects, the role of the faculty member in the section and the relationship of the faculty member and the associate. As you can see there is a lot left to do, but I feel we at least know what direction to go.

Two "pictures" of the lecture series in IDS 10 were presented at the end of that long Saturday. Please let us know what you think of them:

<u>FROM GROUP 2:</u>

Hypothesis: That there are limiting factors to the existence of life.

Values are cause and consequence of action and that values change. The morality of an act depends on the state of the system at the time that the act is performed.

Aim: To confront the limiting factors. To discover those that have been disregarded and those that are self-imposed.

Areas through which to explore the hypothesis:

Air
Water
Food
Space
Mineral Resources
Economic
Political
Personal

Unifying progression: 1st quarter: Global
2nd quarter: Societal
3rd quarter: Individual

Structure: <u>1/3 Credit:</u> Two lecture periods a week. The larger number of these periods to be devoted to the development of the tool (systems analysis) and the principles and concepts of the science, using the theme of limiting factors to give continuity to presentations. Outside persons to be brought in at intervals, followed by discussions and analysis in subsequent lecture periods by faculty, associates, students or any combination of these. (Prepared critiques)

1/3 Credit: One or more section meetings a week devoted to discussion of lecture periods, reading and projects, discussed with reference to the unifying hypothesis.

1/3 Credit: Any exploration of the hypothesis.

14 July 1971

FROM GROUP 3:

The Lecture Series:

IDS 10A. **The World View**
- The systems approach
- Value systems-what are they? How do the operate?
- Bioethics (including basic ecological principles)

IDS 10B **The American Scene**
- Political economy
- American value systems

relation to environ.probs..

IDS 10C **Personal Realities**
- The individual and how his values can effect the environment--both negatively and positively.

The lecture series will consist both of presentations by the professor in charge and by outside speakers. Outside speakers will probably speak on fairly narrow topics and their presentations will be used as examples to illustrate broader concepts. Each lecture by an outside speaker will be followed (at the next lecture meeting) by a detailed analysis of his presentation in terms of the content of the whole series.

Each quarter's lectures will use the broad principles and concepts concepts presented in the previous quarters as building blocks and as points of comparison. The intent will be to work from the broad-based and general to the personal and specific.

Sections:

The sections can be predesignated or not, but in either case, a conscious effort must be made to relate discussions to the principles and concepts presented in lecture..

Projects:

The subject matter need not be restricted, but a requirement will be that the student show how the concepts of the lecture series relate to histopic.

Structure: 2 1½ hour lecture periods/wk
1 1½ hour discussion/wk (others held informally)

If you have any questions, please call me and please send your comments and suggestions on the results of the meeting. We hope to arrange another meeting this summer. If you are interested in attending, indicate the week that would be most convenient for you.

LC:sg

CNR Student Projects

The following list of projects is a selected sampling of the type of efforts developed in the CNR program. The titles reflect the range of interest on the part of the students who have participated in CNR courses. It also represents the comprehensive orientation of the program. In addition, these projects illustrate the degree of flexibility available through this learning environment. Open, flexible and evolving systems represented by CNR, reenforce creativity as well as critical and holistic thinking.

Unfortunately, there have been many projects which simply do not lend themselves to description through titles. These action oriented projects have ranged from a puppet show for teaching ecological principles to children - to the design and production of advertising displays for the Berkeley Ecology Center.

AESTHETICS

Sign Pollution

Waste Receptacle Design

AIR

The Air Pollution Crisis

A Study on Air Pollution

Industrial Air Pollution of the Monterey Bay Area

ALTERNATIVES

Food, Conservation and The Coops

The Food Conspiracy, The Co-ops, and Me Food, Conservatism, and The Co-op's

Ridge Project Food Study

Bicycle Usage

The Growing Trend in Bicycle Usage

Bicycle Security at Pacific Telephone Company

The Necessity of Alternative Lifestyles

Good for Background Information: Bibliography

A Geodesic Dome

An Alternative to High Resource Consumption

A Commune

Dry Goods Ecology Project

R. Buckminster Fuller: Explorer in Comprehensive Anticipatory Design Science and the World Game

ALTERNATIVES (Continued)

Marysville Project - A Study of Alternatives

Capitalism vs. The Survival of the Natural World

The Alternative

Heating Water By Solar Energy

Alternatives to Internal Combustion Engine

Animal Protein Production in an Urban Environment

The Geodesic Dome

Natural and LP Gas Fuels-Alternative to Gasoline

Possibilities for the Utilization of Solar Energy

& % Off to the Country

Alternative Sources of Animal Protein for Human Diets

ANALYSIS

Controlling Dog Related Insects

Air Pollution

A Preliminary Study of Earthworms in the Oxford Tract Garden

The Auto Bomb

Pollution: A Practical Approach

Study on Aircraft Pollution

Forest Fire Ecology

Man, Nature, God and the Age of Reckon

Air Pollution and the Urban Forest

ANALYSIS (Continued)

The Effects of Air Pollution on Human Health

Notes on: Our aborted Attempts on a Fire Ecology Project in Yosemite National Park

Air Pollution Aircraft Emissions

Integrated Control of the Spruce Budworm

Eucalyptus Fire Ecology

Re Introduction of Fire Into Yosemite Valley

Biological Control of Insect Pests

Species and Diversity as Related to Water Pollution in Strawberry Creek

Comparison of Sunlight and Artificial Light

The Effect of Automobile Exhaust on the Growth Rate of Kentucky Blue Grass

The Life of Western Pine Beetle & Its Effects on Forested Areas

BAY AREA

Ecotage of San Leandro Bay

Evaluation Exhibit Inventory of Oakland Reaction Parks

East Bay Land Use Planning

Bay Fill

The Apartment Environment in the South Campus Area

Regulatory Agencies & S.F. Bay

A History of the S.F. Bay Situation

BIRTH CONTROL

Birth Control Clinics on College Campuses

Problems Involved in Birth Control Use Among the Working Class

Birth Control Pills-Possible Effects

Comparison of Attitudes Conc. Pop. & Family Planning

Abortion

Birth Control and Contraceptives with a Particular Emphasis on Inter Uterine Devices

UCB Professor's Views on Population Control

Contraception in the Residence Halls

Looking at the Pill

Woman's Right to Abort: The Nation-Wide Issue in General and the Cowell Hospital Issue in Particular

The Pill: Pro and Con

Politics of Birth Control in China and Japan

Facts on Abortion: Its Effectiveness as a Method of Population Control

Birth Control for Berkeley Students

Birth Control

CALIFORNIA

Palmdale Intercontinental Airport Planning for Supersonic Travel

The Bay

The North Peak of Mt. Diablo: In Jeopardy

CALIFORNIA (Continued)

A Poll

Bay Day and Ectotactics

Examination of Strawberry Creek for Toxic Heavy Metals

Bay Day Research Project on Marine Mammals of the Bay Area and Coastal Waters

Bay Day

Power Lines in Briones Park

Saving Open Space in the Bay Area

Self Initiated Action

The disappearing Land: A Case Study in Solano County

Mapping Berkeley's Creeks

A Report on Strawberry Creek

The Housing Situation: Santa Clara County

Several Aspects in Habitat Selections in Microtus Californicus

S.F. Bay, Is There Hope?

Report on the Berkeley-Marina - Second Quarter

The Albany Bay Fill-An Overview

Pest Management and Pesticide Use on Campus

Report on the Privately Owned Land Located Between Freeway and Berkeley Marina Complex

The Marsh Complex

California Coastal Protection

The San Joaquin Valley: A Case Study of the Relationship Between Urban Expansion and Agricultural Land

Lake Merced

Salt Marsh Area of S.F. Bay

Owens Valley and the Los Angeles Aqueduct

The Struggle to Save the Calif. Coast

The Calif. Water Project

Water Cleanliness in California

Dos Rios and the Calif. Water Plan

Man's Impact on Mokelumme Hill

The Calif. Coastal Alliance in-active Related and Aspects

San Francisco Bay

Report on Belmarin Keys-Situation Prevention Project

Auto Related Space in Berkeley

CASE STUDIES

The Ecological Effects of the VietNam War

The Skyline Scenic Parkway Project

Diary About the Marin Co. Lakes

The Flora of Pt. Reyes Peninsula

Jug Handle Farm Project

Summary of Packaging Project at Co-op

CASE STUDIES (Continued)

Group Project: Report on Privately Owned Land Located Between Freeway and Berkeley Marina Complex

Considerations for a Home-Built Septic Tank

An Investigation of Evars Hall

Radio Media Group

Report on Media Project

Media Group Project: Media Klax f.m 90

CHEMICALS

Entomophobia and Household Pesticide

Mercury Pollution

An Overview of the Mercury Pollution Crisis

San Francisco Highrises

The Steam Engine: A Possible Replacement to the Internal Combustion Engine

The Sources and Effects of Some Hazardous Chemicals

Pesticide Residues in Soil, Water and Air and Some Analytical Methods of Their Determination

DDT - A Study in Experimentation

Critique of Silent Spring

D.D.T.: An Assessment

Pesticide Authorization and Application at Cal.

Phosphates and Entrophication

CHEMICALS (Continued)

Pesticides in Agriculture

D.D.T. from Food to Man and Its Effects

Chemical and Biological Warfare in Southeast Asia

D.D.T.: Insect, Animal, or Human Control

Pesticide Controls

Phosphates in Detergents

The Use of Herbicides in Controlling Undesirable Plants

Untitled - Pesticide Hearings and Philosophy

Preservation of Agricultural Land and Open Space on Pescadero Creek

Source Materials on Oil Shale and nacholite

The John Hawcolk Building

Testing for Mercury Contamination in Strawberry Creek

Palo Alto Foothills Environment Design Study

Phosphate Percentages in Detergents vs the People

Possible Dangers of the Phosphate Substitute NTA

The Berkeley Marina Project

The Ecology of Tilden Park

Chemical Pollutants

Ecological Consequences of Chemical and Biological Warfare

CHEMICALS (Continued)

Flea Collars

The Current Problems of Mercury Pollution

Island of Open Space - San Bruno Mt.

The Chemistry of Pesticides

Bay Development: A Regional Concern

Phosphate vs Non P. Detergent

Scratches in the Mud Toward a Meaningful Understanding of Open Space

The Corporate Influence on Bay Ecology

The Battle of Bodega

Household Pesticides

Pesticide Use

Open Space

CONSERVATION MOVEMENT

How Not to Save the Redwoods

Pajaro II: An Overview

Coastline Bayfill

The Ecology of Alaska and the Oil Pipeline

San Mateo County Coastline Agricultural Land

A Study of the Sewage Situation in Santa Cruz

Economic Review of Shasta County Calif.

A New Look San Francisco High-rises

CONSERVATION MOVEMENT (Continued)

Man's Impact: On Yosemite

Conservation and Local Officials

Sea Ranch

Recreation Development Along the Richmond Coast

Bolinas Lagoon: Develop or Preserve?

Development of Napa County

Bay Day

Bay Day Clean Up

S.F. Bay Landfill Project: The Effects of Landfill on the Bay and on the Land Surrounding the Landfill Projects

A Short Ecological Study of a Mexican Community

Walkin With My Baby Down Beside the S.F. Bay Fill!

Bay Day Committee

E.D.F. and the Trans-Alaska Pipeline

Sterile Erections in the City of San Francisco

The Effects of Bay Fill

Strawberry Creek

Towards A Broader Ecological Movement

The West Berkeley Industrial Park Whose Decision?

Bay Day Committee Report

Strawberry Creek on Campus

Reams of Material

CONSERVATION MOVEMENT (Continued)

Lake Tahoe: Politics and Pollution

A Comparative Study of Pollution in Various Areas of S.F. Bay

East Bay Municipal Utility District and the Environment

San Francisco City Plan

San Francisco

A Base Study of Phoenix Lake Marin County

Bay Day - Analysis of Regulatory Agencies

What To Do With Alaska's Oil?

Strawberry Creek

On the Brink of Disaster - The S.F. Coastline as it Stands Today

Canyon vs Ebmud

A Discussion of the Alaskan Pipeline with Respect to Ecology

DEMOGRAPHIC STUDIES

Factors Influencing Desired Family Size

Factors Involved in Family Planning

The Pyrrhic Victory

Japan's Population: Problems and Solutions

Effect of Rural Life on Population

Implications of Current Population Trends

ECOSYSTEMS

So, What Good Is A Wolf?

Evolution/Adaptation to Environment to Survive

The Utilization of Native Plans

An Approach to the Study of the Carrying Capacity of the Planet Earth Re Home Sapiens

Eucalyptus in the Berkeley Hills

The Effects of Controlled Burning on Animal Populations: Behavioral Responses to a Natural Environmental Stimulus

Alternatives to Prescribed Burnings and Necessity of Such

The Welland Canal and the Great Lakes Ecosystem

Forest Fire Ecology

An Exercise in Carrying Capacity

A Consideration of the Adequacy of Contemporary Climax Theory

The Effect of Sound on Planet Growth

Oak Regeneration

Inputs Which Greatly Effect Oak Regeneration in the Foothill Woodland Ecosystem

The Salt Marsh and Mudflat Ecosystem of S.F. Bay

A Study of the Relationship Between the Argentine Ant and Aphids

An Ecosystem of Paramecium

Biological Adaptations to Fire

ECOSYSTEMS (Continued)

Biological & Other Non-Chemical Means of Control of Cotton Pests in California

Biological Control of Insects

A Preliminary Study of the Effects of Fire on a Watershed Area

Section on Fire Ecology

Forest Ecology

The Ecology of Desert Plants Very Superficial

To Achieve a Stable Biotic Community with Man as a Member

Man and Trout in the United States

The Human in the Wilderness Ecosystem

Problems of Pest Control

The Nature of Recent and Past Extintion

Chlorinated Hydrocarbon insecticides and the Aquatic Ecosystems

Biological Control

An Inquiry into a Man-Nature Interrelationship

On the Flexibility of Establishing a Small Closed Ecosystem

The History of Controlling Burning (Fire Ecology)

Plants and Survival: Yesterday and Today

New Approach to Coping with Environmental Problems

Pest Control Procedures

ECOLOGICAL THEORY

Ecology Teaching

Fourth Grade Curriculum for Ecology

The Ecology Page of the Daily Cal

Ecological University

Living Ecologically

A Look at Ecology Groups

Agriculture in Vietnam and Cambodia

Ecological Communication

Ecology of Apartment Dwelling

A General Assessment of the Underlying Causes of our present Ecological Crisis

Ecological Warfare: Defoliation in Vietnam

SOCIAL POLITICAL ECONOMIC SYSTEMS

Working Through the System

Manual for Intinerant Interns

Election Campaign

Waste in the American Economy The Ad

Marketing Effect of Consumer Report

Ecology and Economic Development: A Study of Interrelationships

The Compatability of the Ecology Movement and the Radical Movement

Advertizing and Ecology

Attitudes toward coastal protection and the Environment

SOCIAL POLITICAL ECONOMIC SYSTEMS (Continued)

The Economics of Environment

Society as an Integral Part of the Environment

EDUCATION

Antipaper Paper

Ecology Teaching

Towards A New Natural Resources Curriculum for the Berkeley Campus of the U.C.

CNR Backpacking Project

The Development of an Environments Page for the Daily Cal

A History of Earth, The Ecology Movement: A Blueprint for High School Ecology Group

What is Oceanography

An Examination of IDS 10

How to Bring People Closer to Nature and Ecology through Alternatives in Education

Eco-Education

Environment and Education (or the Magic Theatre of Learning)

Ecology and the School

Educational Survey on Pesticides Population Open Space

Environmental Crisis Survey

Conservation Education Project A Trip to Yosemite

Ecologizing Unit 1

Report on High School and Grade School Reaction to a Presentation of Population

Critique of a Group Slide Project

Education in Ecology

Ecology Coloring Book for Adults

Sweat Equity or the Industrious Spacing in of Factory Freaks

Untitled - Orginizing A Second "Berkeley Smog Free Locomotion Day" (Bicycle Parade)

Untitled - Giving a Tour of the U.C.B. Campus with the Intent of Sensitizing People to its Ecological State, Changes Over Time, and Possibilities for Improvement

Eco-Action People's Survey Ecology and a New Society

Story of a Commercial for Environmental Defense Fund

Systems Thinking for Second Graders

Eco-Action People's Survey

A High School Ecology Course

Frightening Facts and Where They Come From

Eco-Education

Environmental Song Book

Education and Ecology

CNR Backpacking Project

What's Going on Here

Toward a New Ethic

Identity with Environment

EDUCATION (Continued)

Ecological University Ecosphere Project

Introducing Systems Thinking to Other Schools

ENERGY

The Calif. Sea Otter

Nuclear Energy

Fourth Grade Curriculum

Propane and Natural Gas as Fuels for the Internal Combustion Engine

Life and Energy in Man's Past, Present and Future

The Energy Resources in the U.S.

Man and Trout in the U.S.

Energy in Man's Past, Present and Future

A Brief Consideration of the U.S. Energy Situation

Geothermal Power for the Production of Electric Energy

Some Concerns on the Production of Electricity

Solar Energy: Feasibility and Implications

ENVIRONMENTAL EDUCATION

The Psychosocial Environment of Heart Disease

Avalanche

ENVIRONMENTAL EDUCATION (Continued)

The Asphalt Revolution

Dissolved Oxygen in Strawberry Creek

Environmental Photography with Children

Poisonous Ornamental Plants in California

Environmental Education: Some Suggestions

Environmental Education K-12

Man and His Physical Environment: The Effect of Man's Destructiveness on Man

Environment Education-Critique of Project

Environmental Education

An Experience in Environmental Education

Group Project for Proposition 9

Environmental Education-The Systems Approach and Me

Environmental Awareness Project for Six and Seven year olds

ENVIRONMENTAL HAZARDS

The Meganopse

Ecognolograph

We, the People

Untitled- "Sac-Mega"

ENVIRONMENTAL HAZARDS (Continued)

Untitled- "Well-Thought-Out

Man's Alienation from Nature

Interdisciplinary Art

Cemetaries, Funerals, Etc. (a slide show)

Pseudosolutions: The American Way (an annotated bibliography)

An Ecological Play

Environmental Initiative Group

Publicity "Commercials"

Bay Day

Bay Day Committee: Project Report

Attaining Harmony Between Man and the Environment of Earth

The Dogmas of Possibility

Play on Environment Problems

A Liberating Environment

Bay Day

Man's Effects on the Environment Through His "Management" of its Waters

Clean Environment Act, Group Project

Changing My Head

Ecology Center Poster

A Look at the Environment

Growing Up in Florida

The Human Animal

Fifty Cents Worth of Solutions

Environmental Concerns . . .

Exit Eden

ENVIRONMENTAL LEGISLATION

Initiative Procedure: Placing a Measure on the Calif. State Ballot

People's Lobby and the Clean Environment Act Plus Birth Control at the University

The Clean Environment Act: Proposition 9

Environmental Law

So She Said, "You Can't Fight City Hall"

Untitled-"Very Good Review of the Current Situation of the 160 Acre Law"

List of Gov't. Agencies Concerned with the Problems of Our Environment

The California Ecology Corps

Environmental Politics and Law

Richard Milhous Nixon as Environmentalist

Report on Air Pollution Legislation

A Legal Case on Industrial Pollution

Ecology in Government

Environment in Crisis-Richmond, Ca.

Access to Beaches in California

Petitioning-P.G.&E. Berkeley

ENVIRONMENTAL LEGISLATION (Continued)

Protective Food Legislation
Dairy Germany- US

Group Project for Proposition 9

Political and Legal Alternatives to the Status Quo Mechanisms of Controlling Industrial Pollution

ESSAYS AND ART FORMS

The Green Revolution: A Critical Essay

Labor Displacement Through the Green Revolution

Fiction: Poetry

On-Going Evolution

One Student in Search of a Project

The Coming Agricultural Crisis

Man-Created from the Harmony of the Elements

Land Use in Mid-Peninsula

Ecology of My Mind of How to Save the World by Taking One Deep Breath

The Great Browning

Essay

The Green Revolution

"Ode to an IDS Project"

Journalism Dr. Eco Column

ESSAYS AND ART FORMS (Continued)

What is the Contribution of Ecologically Unsound Practices to Productivity and Are They Necessary for Our Present Productivity?

Pictorial Essay on Defied Waters U.S.A.

Flowers

Agricultural Production in the Humid Tropics-Present and Future

The Destruction of Environment Fiction/Photos

Man's Perception of the Environment: A Photographic Essay

"To be is to do"-Socrates
"To do is to be"-Plato
"Do be do be do"-Frank Sinatra

Essay

ETHICS AND BIOETHICS

Future, Values (according to R.B. Fuller and others)

Toward a Strategy for Survival

An Investigation Into Some of the Causes of Man's Need to Control and Dominate the Environment (Philosophical)

The Causes and Effects of the Exploitative Nature of Man

A Study of Human Behavior in Regards to Cleaning the Immediate Environment

R. Buck Fuller, Commoner, Ehrlich

ETHICS AND BIOETHICS (Continued)

Survival Starts at the Grass-roots

Which Way?

The Native American's Relationship to His Environment

American Indian Film

Arsenal of Chemicals, Death, Environmental Changes, and Moral Responsibility

Change in Attitudes

Awareness: Ecology and Self

The Disaster of Dying

Comparison of Indian Communities Otivi and Asillo on the Andean Altiplano: and the Effects of Agrarian Reform

FOOD AND NUTRITION

Food Conspiracy, The Co-op's and Me

World Politics and Hunger

Fish Protein Concentrate

Drying Fruit with Sulphur Oxide

Food Plus Poison

Enjoy Natural Foods that Agree with You

Food for the Future: How Will We Feed the Masses

Raising Chickens at Home (in the City): Practical Information

You Are What You Eat Good Into. On Nutrition

Untitled-Essentially 2 List of Common Foods

FOOD AND NUTRITION (Continued)

The Nutritive Value of Macrobiotic Ea ng

Vegetarianism in India

Advertising Effects on the Consumer Exemplified by Cereals

The Art of Baking Good Bread

Food Problems of the U.S. coming in the Next Decade Overview

Bread and Sugar

Organic Foods

Organizations Created to Deal with the World Food Program-A History in General Meals-For Millions in Particular

Vitamin C

How Well Do We Eat?

Vegetable Proteins as a Solution to Malnutrition in Tropical Africa

Milk Contamination: A Fraction of the World Ecological Disaster

Rice: Relief for Indo Chinese Ecology

You Are What You Eat

The Significance of Food

Food Supply

Food for the Future

Pregnancy and Nutrition in the U.S.

The Foods we Eat

Chemical Food Additives and some Possible Biological Effects

What I Learned About Preserving Food

FOOD AND NUTRITION (Continued)

Quils Mangent De La Brioche (USA Food Production)

Food Additives and Man

Rice- Its Importance to the World

The Food Revolution from the Sea-Ecological Problems

Malnutrition, Learning and Behavior

An Overview: Food and Numbers

Food Additives

The World Protein Hunger

Seaweed as Food for Man

Sanitation in Food Selling Establishments

People and Their Food

Ecological Crisis and Famine from the Standpoint of Food Production

Proper Nutrition and Pregnancy

Infant Morality and Nutrition

Chemical Additives in Food

Wine: Wine Making Procedures and Evolution as a System

Food and Nutrition

A Study of Nutrition and Food Trends in the American Public

The Food Industry's Big Secret: What's in Our Food

Wild Edible Plants of the Berkeley Hills

FOSSIL FUELS

Wm. Bennett vs. El Paso Natural Gas Co.

The American Coal Industry

An Analysis of the Oil Depletion Allowance

Natural Gas Conversion of Gas Powered Automobiles

Oiland Gas Conservation

HISTORY

The Political and Social History of Conservation

The New Conservation

A Historical, Environmental and Economic Report on the Walnut Creek Sanitary System

HISTORY OF POPULATION GROWTH

War and Population Growth

Malthusian Theory

The Interrelationship Between the Ind. Behavior and the Population Explosion: A Historical Perspective

The Neolithic Revolution and Some Speculations on its Consequences

India's Population Problem

The Population Problem of Japan

LAND

Soil Erosion

LAND (Continued)

A Survey of Land Use Proposals for Berkeley's Waterfront

The Systems Approach to Farming

Man's Role in Changing the Face of the Earth

The Recreational Land Crisis in Chinatown, San Francisco

The Cultural Landscapes of Brooktrails Redwood Park

Rural Land for People

Power and Land in Calif. (Nader Report)

Power and Land in Calif. Report Chapter Three Water Distribution and Quality

Are you Aware?

Man and Changes in the Soil

Land Use Planning in San Mateo County

The Land Ethic

A Comparative Study of the Auifavna of a Grassland and a Wood Hand Pond

Open Space-A Reginal Plan for the Bay Area

Land Use for Amador Co., Calif.

LIFE-STYLES

Your Daily Deed (Alternative Life Styles)

Modern Day Pioneering-A Slightly Systematic Approach

Lifestyles

The Week I spent as Councilor at Mendocino

Your Daily Deed (Pamphlet)

A Philosophical and Practical Discussion of Alternative Life Styles

The Commune as an Ecosystem

Building a Geodesic Dome

MINERALS

Consumption of Metals

NOISE

Noise Pollution

Some Causes and Proposed Solutions to the Problems of Environmental Noise

The Effects of Sound on Plant Growth

Noise Pollution Can Drive You Crazy, Make You Deaf, or Kill you. Then you will have Some Peace

Environmental Objections to the Supersonic Transport

Noise Effects on the Human Body

Environmental Audition

Noise Pollution as a Serious Environmental Consideration

Noise Pollution

How Do Recreational Sounds Affect Man?

Silence is Golden

Necessity is the Motor of Invention

Noise: It's Nature Sources and Effects

NORTH AMERICA

A History of Wolf-Man Relations in North America

Mapping Berkeley's Creeks

Castle Rock and Its Future

The Marysville Reservoir Project

Master Plan: Woo's Lake and Watershed

Where Did Clear Lake Come From?

Polyethylene Plant Shelter

Tahoe Development

Yosemite Valley

A Brief History and Description of the Calif. Wild Rivers Bill

San Francisco, Twolumne River, Hetch Hetchy

The Dos Rios Project: An Unnatural Disaster

Boise Cascade Subdivision

OCEANIC

The Pacific Salmon Fishing Industry

Man and the Sea

The Best Laid Plans of Mice and Men . . .

Surviving at the Ecology Center

The Exploitation of the Sea Offer in North America 1741-1970

Who Gets the Salmon? Or: Something is Fishy in the State of Washington

An Introduction to Ocean Ecology Concentrating on the Finfish Fisheries

OCEANIC (Continued)

Probing the Dark

Rare and Endangered Species of California

Faculty Environmental Resource Questionnaire

An Analysis of the Pascadero Creek Development Problems to Fisheries and Fish

Report on the Proposed Damaging of the Klamath, Eel and Trinity Rivers

Pupfish

Rare and Endangered Species

The Birth, Life & Death of the Whale

The Gradual Decline of the Whale Species

The Berkeley Geology Center

ORGANIC GARDENING

Soil Animals

An Experiment in Urban Container Gardening

Making Beer, Composting and Gardening

Organic Gardening and Composting

Plastic Mulch

Aphids and Fava Beans

Plant Shelters

Municipal Composting

A Joint Project l. Experience With Organic Gardening ll. Attempts to Institute Ecology Course in a Sacramento High School

ORGANIC GARDENING (Continued)

Some Plants Grow in Bottles

Our Garden

An Introduction to Organic Gardening

Trying to Follow the Olkowski Model

Seed Sources for Urban Gardening

Filth Flies of Berkeley

Scratch Lettuce

The Relationships Between Plant Growth and Soil Acidity

Some Investigation into Soil Fauna at the Oxford Tract Garden

Where Have All the Flowers Gone?

Closed System Aquarium; Organic Food Diet, Ecology and the Woman's Movement

Hydraponics: A Possible Alternative to Present Methods of Crop Production

Organic Gardening: An Experiment with First Graders

Degree of Decompostion of Compost Starch Iodine Method

Introduction-The Nature of the Ecological Crisis

Plant Interrelationships and the Seed

Small Guide to Organic Insect Control

Data Compilation of Rare Flora and Fauna in the SFPUC's Peninsular Watershed Lands

Composting

Annotated Bibliography, Growing Edible Plants Book Reviews

Is Organic Food Organic

The Organic Gardener's and Farmer's Answer to Chemical Fertilizers and Pesticides

The Green Revolution-An Answer to Agricultural Problems or Ecological and Sociological Disaster?

Vegetables of the Oxford Garden

Agriculture and Oil

Breaking Dormancy in Seeds

A Biological and Distributional Analyses of the Extinct and Endangered Rhopalocera of the S.F. Bay Region

The Urban Farm of Bill and Helga Olkowski

A Handbook on Mushroom Cultivation

Beginners Guide to Composting

Leaf Compost Progress Report

Materials and Methods for Apartment Gardening-Or How to Grow Vegetables Without Any Land

Comparing the Method of Fertilizing Now Being Used at UC With Leaf Mold Composting

Composting: For the Home Gardener

How to Compost in Your Own Back Yard

Container Gardening

Study in a Terrarium

Larkspur: Community Composting

ORGANIC GARDENING (Continued)

Growing Summer Plants Out of Season (Greenhouse Techniques)

Learning About Organic Gardening

An Excellent and Amusing Introduction to Organic Gardening Done in "Cartoon" Style

Application of Principles of Lunar Gardening

PARKS AND RECREATION

U. S. National Park Service Policy Yosemite The Master Plan and Wilderness Proposals

Multi-Purpose Recreational Open Space

Recreation Development Along the Richmond Coast

The Environmental Aspects of Walt Disney World

Up Against the Wall

Space and Silence in the Sierra Nevada

A Study of the Flora of the Pt. Reyes Peninsula

Redwood National Park

Yosemite Project

An Elegy for Calif. Beaches

Wild Rivers; Progress Vrs. Protection

Regional Government and Open Space

The National Parks of the U.S.

Wilderness and National Park Service Policy

PARKS AND RECREATION (Continued)

The Role of a State Park Ranger in the Administration, etc.

Mammoth Cave Natural Park

Open Space

PLANNING

"To Grow or not to Grow", That was the Question

Underground Homes as an Alternative

Advertising and Sales of Second Home and Recreational Land

Planning A Future in Tuolumne Co.

Public Housing Projects

The City

New Future: Archology

Thoughts on the Fate of Nicasio Nicasio

Population Questionnaire

How to Defeat a Giant Corporation at the Local Level

A Quiet Person's Guide to Berkeley Sanctuaries

Spatial Considerations in Architecture and Ecology

Arcology: Discussion of Paolo Soleu's Philosophy and Work

The Dwelling Unit: New Criteria New Design

Study of Development of Sonoma State College Area

Plastics in Pakeging

POLLUTION

The Economic and Political Considerations . . . To Eliminate Air and Water Pollution

The Effects of Man-made Pollution on Himself and His Environment

Genetic Pollution

Pollution: Its Effect on Phytoplankton

Radiation Pollution

Oil on the Waters

A Study on Aircraft Pollution

The Pollution Control Industry

Air Pollution

A Study of the Pollution of the NAPA River and The Laws Covering it

Communities vs. Air-Pollution

S.F. Oil Pollution Attitude Survey

Sketch and Data for a Movie Dealing with Air Pollution in the Bay Area

Effects of Water Pollution with Emphasis on the S.F. Bay Area

Air Pollution in the Bay Area

Oil Pollution and Marine Life

Pollution-Litter

The Projection of People's Pollution

Visual Pollution or Goodbye S.F., Hello New York: A Study of the U.S. Steel Building

Air Pollution in the S.F. Bay Area

The Santa Barbara Channel Oil Disaster

Oil Pollution: Legal Means of Solution to the Problem

Santa Barbara Oil Disaster

Air Pollution in the Bay Area

The Accountant's View of Pollution

Air Pollution and the Urban Forest

Pollution and Evolution

Economics and Air Pollution

The Evolution of Pollution

Structures and Powers of the Bay Area Air Pollution Control District

Pollution in Strawberry Creek

Auto Pollution

An Analysis of Carbon Monoxide in the Bay Area Basin

Pollution: An Agony in Three Fits

The What and Why of Air Pollution

The Pollution Control Industry

Calif. Automotive Air Pollution Control

Adaptation: The Key to Man's Survival

POPULATION

Over population and Famine: Growing Problems in a Shrinking World

Too Many People

POPULATION (Continued)

The American Ideology In the Study of the Population and Pollution Crisis

Untitled: "Survey of class members to discover attitudes toward population control, future plans for families, and views on differentiated sex roles

A Survey of IDS 10 A Concerning Population and Differences Between Sexes

Limits on Human Population Growth

Scrambled Thoughts on Over Population

Population Crisis

The Psychological Effects of Over-Population

Population and the Environment

Effects of Overpopulation on Human Biology and Physiology

The Regulation of Human Population

The Population Problem

Behavioral Adaptability-Our First Consideration?

Overload: A World in Trouble

Project to Increase Public Awareness of Consequence of Pop. Growth

Skit on Population (script)

Effects of Crowding

Population: The Worst Cancel of All (Good Overview)

Population: The Students Opinion

World Population and Food Supply: Protein Needs and Ways of Meeting Them

Overpopulation: Man's Greatest Threat

The Problem of Overpopulation in the United States

Two Sides to Population Control

The Population Crisis

Population v.s. Technology

The Population Crisis and Proxemics

The Population Crisis, it doesn't Exist!

Population Attitudes Survey Analysis

The Problems of Overpopulation

Behavioral Adaptations to Overpopulation: A Field Study of Rhesus Monkeys in North India

Population Poll

Population and Conscience

Population Survey

POPULATION CONTROL

Some Cultural Aspects Population Control

Genocide in the Black Ghetto

Past and Present Population Controls

Population Control Policy In the U.S.

POPULATION CONTROL (Continued)

Study of Population Control Attitudes in Two Women's Residence Halls, U.C.B.

Abortion: Fertility Control

Population Control and Education

Soil as a Limiting Factor in Overpopulation

Population Control: Current Programs, Future Prospects

Paul R. Ehrlich: Moral Issues in the Population Crisis

Population Control

Population Limitation of Family Size and Religion: A Survey

The Adaptive and Maladaptive Consequences of Direct Population Control of Family Size in the U.S.

If you want to Adopt a Child

An Ecologically Sound Family Structure

The Population Crisis and the Call for a New Morality

The Necessity for Artificial Human Population Control

An Investigation into the Attitudes of the American Public and its Leaders on the Question of Population Control in the United States

Zero Population Growth, Inc.: Its Aims, Goals, and Activities

Leaflet Pollution

Population and Man's Urgent Problem

POVERTY

Chinatown, San Francisco

The Great Famine of Ireland 1845-1849

POWER PRODUCTION

Public Utilities

Planning for Power, P.G.&E.

Nuclear Power Plants: A Problem on a Solution

Power Generation and its Effect Upon the Environment: A Critical Assessment

Methane Generators: A Partial Solution to the Waste Problem

Electric Power, the Industry that Produces It and Why It Grows

Paper Consumption in the Computer Industry

Power Use in Supermarkets

Electric Power and Cal. Environment

Energy and Nuclear Power in the U.S. Economy

Quirks and Oddities in the Structures of the Atomic Energy Commission

The Federal Power Commission and Power "Needs"

NAWAPA, Boon of Boondoggle?

The Northeast Power Crisis of the 1970's: A Preview

POWER PRODUCTION (Continued)

Solar Power

Nuclear Reactors: A Bomb or A Blessing?

ISSUES

Bangla Desh

National Environmental Policy Act of 1969

Stebbins It All, Ecological Disaster Through Cooperative Living

Pat's Campaign-For Berkeley City Council

The Outdoor Advertising Industry in America

The Marketing Effect, Consumer Report and Cooperative

The Dooms Day Approach to Ecology: Half-truths equal lies

PRESENT ORGANIZATIONS

PUBLIC HEALTH

The Effect of the Emotions on Digestion

The Berkeley Free Clinic

Services and Alternatives for Berkeley People

The Psychology and Physiology of childbirth-or-what it feels like and what happens when you have a baby

Western Medical Institute of Research

Dogs: Behavior and Disease

PRESENT ORGANIZATIONS (Continued)

PUBLIC HEALTH

The Long-Term Effects of Pesticides on Bird Reproduction

A Level Headed Look at Predator Control

X-Rays: Use and misuse

A Study of Slugs at Oxford Project

Air Pollution and Health

What I Learned from my Project: "Interview with Bill and Helga Olkowski

The Oldest Drug

Biological Control and Oxford Project

The Shelter Story (Green House)

Enthanasia and Medicine

Pesticides Currently Used on Our Campus

Pesticides: Public Health Aspects

Changing Aspects of Disease, Its Treatment

The Chinatown Environment and Health Situation

RACISM

RECYCLING

The Ecology Movement as a Shuck

The Recycle of Wastepaper

Starting A Recycling Program in a Living Group

Recycling: Is it worth the cost?

RACISM (Continued)

RECYCLING

Bike for Life and Recycling in Unit I

Recycling of Fly Ash

Waste Recycling

Recycling Building Materials

Recycling of Aluminum

A Brownie Troop Leams to Recycle

Soil Mites: their function and Distribution in Terms of the Recycling of Organic Material

Recycling: An Attempt

Newspaper Recycling: Davidson Hall, Unit II Residence Halls

Recycling in Unit II Davidson Hall

Capwells Finer Stones? Commercial Recycling Problems

No Deposit-No Return

Earth Re-Use: The Story of Recycling on the Northside of Town

Recycling: The Only Real Solution to the Solid Waste Crisis

Waste Problem and the Recycling of Waste

Yosemite Recycling Center Report

Recycling Program

Soil Testing Methods for Absorbtion

Recycling: Another Overview

Untitled- A well-written, well-documented overview of recycling. Focus on economics of.

Recycling Residential (Dorms)

Scrap Metal Wastes: The Economic Rational for Recycling

Solid Waste Disposal: A Dilemma

Unit I Recycling Project

Recycling-Setting Up A Program

The Waste Disposal Problem & Recycling

Recycling in Berkeley and in Campus (The Rising Recycling Consciousness)

Recycling at the Computer Center

Paper Recycling

The Recycling Problem

Waste Disposal-Recycling the English House

On Collecting Garbage

An Investigation into the ASUC Recycling Program on the UC Berkeley Campus, 1971 and other Recycling Efforts

Ecology and Recycling: Thoughts and Application

Recycling and Composting: An Ecological Approach to the Solid Waste Crisis

RENEWABLE RESOURCES

NON-RENEWABLE RESOURCES

Bureaucratic Organizations and Human Beings

Non-Returnable Beverage Containers

RESOURCES

To Survive (Evolution)

Remote Sensing and the Management of Earth's Resources

Quarry Operations

Cybernetics and Ecosystems in Future Resources Planning

Resource Use and Population Growth

Just Why Do We Develop Our Resources

Population and Resource Use and Pollution

SIMULATION

SOCIAL PROBLEMS

A Study of Inter-Relationships Between Dormitories

A Study of the Relationships Among the Ecological Crisis and Our Language, Psychology and Religions

IDS 10C Project and Anti-War Activity

Overcrowding and Social Stress

SOLID WASTES

The Solid Waste Crisis in Our Environment: A Brief Look at Some of the Major Causes, Effects and Solutions

Technology's Approach to Waste Treatment; An Interview

Waste

Municipal Solid Waste Management Problems

SOLID WASTES (Continued)

Untitled- Overview of solid waste problem in Calif.; "Photographic Expedition to the Berkeley Dump"

Sewage Treatment in Canyon

Garbage and the Systems Approach

Solid Waste: At Your Disposal

An Alternative to the Berkeley Dump

Cannery-Mechanization Equals Waste

Sanitary Conditions Through History

Solid Waste Disposal and the Upcoming Plastic Threat

A Study of Food Waste at Ridge Project

Ecology of Solid Waste Management

Refuse: A Wealth of Waste

Remote Disposal of Solid Wastes for the S.F. Bay Area

Waste in American Society

SYSTEMS THINKING

Systems Game

Lecture Outline-A Critique of the Systems Approach

Underground Construction

A Student's Insight Into Systems

Black Mesa Crisis

Effectiveness as a Function of System Consideration

THE WORLD

Western Effects on African Ecology

Unity in Diversity, the Paradox of Modern Indonesia

Hawaii in the Environmental Crisis

Industrialization Effects: Soviet Union

This Beautiful Earth

China and the Environmental Crisis

The Vietnam Herbicide Experiment

Ecocide in Vietnam

Effects of Defoliation in So. Vietnam and Cultural Significance

THERMAL

Thermal Pollution

Thermal Waste

Thermal Pollution in a Fresh-water Ecosystem

Thermal Pollution and its Effects on Fish

Thermal Pollution

TIMBER

Clear-Cutting and its Effect on the Forest System

Forest Management in the Sequoia National Forest

The Redwood Conflict

Recurring Recurvia: The Lodgepole Needle-miner in Yosemite National Park

TIMBER (Continued)

A Study of Logging Practice in Six Rivers National Forest

Forestry

Trees

National Forest Logging Practices

The Effects of Clearcutting in Sequoia National Forests

Fire in the Redwoods

Clear-Cutting Techniques of the Sequoia National Forest

Trees and City

Timbering in National Forests

TRANSPORTATION

Bicycle Use

The Urban Transportation Crisis

The Urban Environment

A Search for a More Effective Mode of Transportation

Automobile Congestion and Pollution

The SST-An Ecological Disaster

Bikeways in Berkeley

Study of Urban Transportation Systems

Untitled-Traffic Problem (cars) at McClellan Air Force Base

The Quadracycle

Non-Polluting Alternatives to the Internal Combustion Engine

TRANSPORTATION (Continued)

One Small Step for Man: And He Falls Flat on His Ass! Interstellar Transport

Bicycle Lanes on Public Streets, Legislation and Funding

Bart

Bicycles in Berkeley

Cross Sound Transportation (Pugeti Sound, Washington)

Hearst Ave.-BART Strip

The Trans-Alaskan Pipeline System

Mass Transit, An Alternative to Pollution

The Southern Crossing, A Turning Point in Bay Area Transportation

The Impact of Snowmobiles

Transportation: Mass/Rapid Some Discussion of the Advantages of Rapid Transit

Transportation in Santa Clara Co.

Destinction or Recreation Trail Bikes

URBAN DEVELOPMENT

A Guide to Neighborhood Development

Stress

Urban S.F. Divisadero St. Community

Urban Renewal: Marina View and Riverside Mall Projects-Pittsburg, California

The Ecology of the City

URBAN DEVELOPMENT (Continued)

The Urban Design Plan for the Comprehensive Plan of S.F.

Less Is More or the Rape of Prime Agricultural Land and the Quality of the Suburban Environment

A Review of the Urban Design Plan of San Francisco

Urban Renewal and the West End

Urban Renewal: Yerba Buena

Alternative Animal Protein Sources for Humans. Insects as Human Diet in Urban Areas

The City of Man-Environmental Adaption and Destruction Through Urban Design

Urban Studies Report, IDS 120 Critique, The Radio Report

Urban Design in San Francisco

Urban Growth, Stockton, Calif.

Summary of Major Environmental Legislation

The Problems of America

Bay Fill . . . Redwood Shores

WATER

Calif. Water Companies and their Filtration Processes

Water: A Resource Unit

Desalination of Sea Water

The Calif. Water Plant Project

Waste Water Reclamation and Southern Calif.

WATER (Continued)

A Commentary on the Problem of Flood and It's Solution

Water Resources and Population-A Calif. Study (An In-Progress Report)

Nawapa Boon or Bondage

The Calif. Water Project: Is There An Economic Alternative?

The San Leandro Creek Flood Control Project

Water Desalination Progress and Techniques

Gravel Flow and the Russian River

Feasibility of Proposed Water Development on the Eel River

A Modest Proposal-Water for Survival

Waste Disposal-Glimpses Past, Present, Future

Aswan Dam Project Negative Effects

People, Water and the State of California

Water in Calif. Focus: Calif. Water Project

The Jack and Simmerly Sloughs Flood Control Project or Waterfowl Habitat Elimination in One Easy Lesson

WATER POLLUTION

Water Pollution- Monterey Bay, Ca.

Ecological Crisis: The Water Pollution of Lake Tahoe

WATER POLLUTION (Continued)

Water Pollution Problems of America

Water Pollution and The Law

Pollution and Lake Eric

Sewage Treatment in Petaluma

Water Pollution in the S.F. Bay Region

Pollution at Bolinas Lagoon

Salvation of Waterways (a Pollution Solution)

Detergent Effect Study

Cancerous Fish and Sewer Outfalls

Part I Synthetic Detergents
Part II Analysis of Water in S.F. Bay Area

Water Pollution and Lake Erie

Sewage Treatment

Salt Water Intrusion in Alameda Co.

Industrial Waste and Water Pollution

Thermal Pollution and it's Effect on Fish, An Annotated Bibliography

Algae Blooms

WESTERN HEMISPHERE

The Concept of Nature in Western Culture

The Ecological Crisis as it Relates to UDC, Guatemala

WILDLIFE

Earthworms

The Effects of Endrin on Wildlife

Wilderness

Control of Calif. Ground Squirrel

Oxford Garden Wildlife Display Cont.

Yosemite Master Plan and Wilderness Proposal Report and Critique

Endangered Wildlife

A Wildlife Refuge for the South Bay

Preparing a Study of Wilderness Users

Preserving Our Wildlife

Jug Handle Farm Project

Wildlife Conservation and Management

Wilderness in America: A New Perspective On Its Preservation

Man's Effect on Wildlife

The So. S.F. Bay Wildlife Refuge

Fiction: Means of Preserving Wilderness: Attitudes

How Much Wilderness Protection Should the United States America Have?

An Analysis of the Wilderness Act of 1964

A Good Attach on Ardkey et-al Eden Revisited Is Man Really An Aggressive Animal

Animal Refuge Sites and Development of A Community Program

REPORT ON PRIVATELY OWNED LAND

LOCATED

BETWEEN FREEWAY AND BERKELEY MARINA COMPLEX

This is a project developed in one of my sections of IDS 10A, Fall, 1971. Utilizing an ecosystems approach and incorporating many of the implementation techniques (Quaker method) described in Chapters III and IV, fifteen students took seven weeks to identify, understand and resolve a comprehensive environmental issue. (Resolve implies here formal presentation at the Berkeley City Council as was the students stated purpose and as the council was their client) The level of resolution that was selected arose out of the time, money, and information constraints exposed within the creation of an holistic perception of the situation.

OUTLINE

INTRODUCTION

The following report is a group project prepared by one section of Interdepartmental Studies 10A at U.C. Berkeley. In attempting to deal with the problem of the undeveloped lands on the Berkeley Marina we have attempted to employ a radically new technique: the systems approach. The systems approach tries to define or clarify every problem or alternative involved in a particular question. Using this method does not assure that in our search we will evolve a perfect solution to every question. Rather, by discussing alternatives, we attempt to anticipate the major consequences (good and bad) of any particular action. Realizing these consequences, we would hope that we are better able to make correct decisions in important issues.

In preparing this report, we have sought to overcome individual biases and inclinations in order to present an objective analysis of the "system" involved. Certainly our efforts have been hampered by problems of time and access to information. Having called your attention to these difficulties, we apologize for any omissions or repetitions which occur in the report. Also we would remind you that several of our group will be present at the hearing to amplify or clarify statements made herein.

Basically we have divided the report into three sections. The first deals with the acquisition or disposal of the properties in question, the second with the possible alternatives uses for the land and the third with the various problems of transportation and access (assuming development). Each of these sections consists of an outline and numerous appendixes which amplify the material sketched in the outline. Also included are public opinion surveys and a section in which group members were encouraged to make additional comments regarding their research.

As noted above, we have tried to refrain from making value decisions and from suggesting <u>specific</u> courses of action. We realize that at some points the report may seem simplistic or fragmentary. However, we feel that this deficiency is more than compensated for by the scope of our work. We feel that ours will be the only report presented to the council which does not represent a special interest group of some kind and consequently will be of the most value when making decisions concerning the larger community.

Certainly, as we have indicated in our outline, there are numerous disadvantages related to every alternative for the acquisition or disposal of the Murphy and Sante Fe lands on the Berkeley Marina. When considerations are limited to acquisition directly by the City, many already undesirable effects are compounded by the terrific expense involved. Still, I would interpret the sentiment of a good portion of our own group and many other interested groups as indicating a preference for just this sort of acquisition. Generally, the feelings of these groups and individuals is that the land can be used to the best advantage of our own community only if it is administered locally and autonomously.

Working from this premise, a long-term lease with an option to buy the land at some future date seems to be the most attractive of those alternatives immediately open to the City of Berkeley. Though the outline is reasonably specific in this regard, the various advantages and disadvantages of the proposal do need some amplification.

In terms of cost, immediate expenses are defrayed substantially. Consequently the cost of or even the need for a municipal bond is greatly reduced. As in any deferred payment arrangement, however, the cumulative price of the parcels is increased. This overall increase might be offset by the advantages gained from the infinite possibilities for usage assured through local, public ownership. More precisely, a variety of uses for the area might be tried and evaluated or explored without ever making a large capital committment. At the very worst we might be "stuck" with 84 acres of undeveloped open space for an extended period. (An alternative which itself is not too unattractive considering the urbanized nature of the surrounding communities.) At best, an integrated plan for development might produce a multi-use facility which might be both aesthetically pleasing and financially self-sufficient. (This might be true even if financial returns were indirect.)

Considering the defrayed nature of the payment schedule proposed, it is also essential to note that small commercial developments (i.e. craft center, farmer's market, conference facilities, etc.) might be sufficient to defray expenses without transforming the property into what would be a principally "commercial" area. Additionally, having once made this committment to acquire the land itself, the City would always be free to release the land for major commercial development to recover costs if the situation were to demand it.

Finally, the negotiation and successful completion of such a lease would place a definite cash value on the property which would allow Mr. Murphy and Sante Fe to dispose of their interests completely by selling their leases to a land holding company. The major disadvantages to the plan revolve around the lack of local precedent and the negotiation of an acceptable lease.

We have included a section on the possibility of the acquisition of the undeveloped Marina properties under state laws dealing with preservation only because we felt it to be a very real alternative and not because we are well acquainted with state laws in this area. The various laws included in the outline are there primarily as examples rather than as suggested courses of action. Without a doubt, some of these statutes are inapplicable, while others, perhaps more valuable, have been left out entirely. Certainly with more time, this section could be refined substantially. If the council is interested in such alternatives at this time, however, we can only suggest that they explore these and other state codes in more detail.

Acquisition or Disposal

A. Public

1) City of Berkeley

a) Bond Issues

1. Regular Bond Issue (municipal bond funded by property tax)

a. Advantages

1. Complete local control

2. Bond issue might include possibilities for incorporating a popular referendum on land's future

b. Disadvantages

1. Probable failure (opinion based on already high tax scale and on failure of recent bond elections)

2. There are, perhaps, better uses for the city tax dollar (i.e. school needs, welfare needs, job training, etc.)

3. Basic regressive nature of property tax

2. Revenue Producing Bond

a. Advantages

1. Does not increase property taxes and thus increases the probability of passage

2. Maintains complete local control

b. Disadvantages

1. Limited possibilities for revenue production (thus limited uses)

2. Forced development of the land

3. Risk still involved in the election

b) Long term lease with option to buy

1. Advantages

a. Minimizes cost of municipal bond (possibly eliminates the need for such a bond)

b. Maintains local control (places no limits on possible uses and allows for experimentation)

c. Need to produce less revenues to cover costs (i.e. allows for small as opposed to large commercial developement)

d. Would enable current owners to sell their property to a land holdig company

2. Disadvantages

a. Even though the price is defrayed over an extended period of time, the total purchase price will be increased

b. City commits itself to a long-term, binding financial obligation

c. To our knowledge, leases with options to buy has never been attempted before in Berkeley

c) Trade or sell other city properties for the Marina lands (for instance, Aquatic Park, Santa Fe Corporation Yards, etc.)

1. Advantages

a. No necessity for raising additional capital for acquisition

b. Maintains complete local control

c. Capital Gains Tax will be increases in near future thus giving present owner motivation to trade now

2. Disadvantages

a. May raise price of land

b. Difficulty in finding suitable trading property

c. Present owner indicates disposal not trade has priority

2) State of California

a) East Bay Regional Parks

1. Advantages

a. There is state money available for purchasing an as of yet undetermined piece of property in the area (Crescent Lands) from Richmond to Oakland Bridge for recreation purposes

b. No expense to the city of Berkeley

c. Parcel is centrally located with regards to several Bay Area communities (a prominent argument of those who desired to build the shopping center)

d. There is no East Bay Regional Park on San Francisco Bay

2. Disadvantages

a. Limits options (recreation only)

b. No guarantee that EBRP will purchase this particular parcel even if it is made available

c. In terms of costs, the parcels in question would be rather expensive to develop

d. Loss of potential for short-term, identifiable revenues (this statement is made with the realization that there is no perfect way to assess the long-term aesthetic and financial impact of such a park on the community)

e. The city will have little control

b) Acquisition of the property under various state laws dealing with preservation policies

1. California Constitution

a. Article 28, Open Space Conservation Sections 1-2
The people declare that it is in the best interest of the state to maintain, preserve, conserve and otherwise continuein existance open space lands for agricultural purposes, scenic beauty and recreation. Assessment practices must be designed to permit the continued availability of open space lands for these purposes. Land designated by the Legislature as open space shall be assessed on the basis only of such restriction and use.

2. Government Code

a. Sections 6950-6954; 7000-7001 - Scope: Acquisition of Parkland by Cities and Counties - Legislative intent to provide means whereby cities and counties may aquire property, in order to preserve open space and other areas for public use and enjoyment.

b. Sections 37353-37361 - Cities may acquire property for parking, streets, tunnels, golf courses, and for the preservation of historical landmarks.

c. Sections 51200-51295 - Scope: California Land Conservation Act of 1965 - Any county or city having a general plan may establish an agricultural preserve to discourage premature and unnecessary conversion of agricultural land to urban uses. An agricultural preserve shall consist of at least 100 acres; however, two or more parcels of land may be combined for this purpose if they are contiguous or in common ownership, and there are certain other exceptions to the minimum acreage requirement.

Preservation is effected by a contract between the landowner and the local government. Each contract must be for an initial term of no less than ten years. Contracts may be cancelled in certain cases, but only at the request of the landowner.

(Amended 1970, A.B. 2178; Chapter 1281) Sections 51201 were amended to include lands devoted to recreational uses, as well as agricultural lands, within the meaning of the Act.

d. Sections 65800-65908 - Scope ; Zoning Regulations - Cities and counties may regulate the use of buildings, structures and land as between agriculture, industry, business, residence and other purposes, etc.

3. Public Resources Code

a. Sections 5099-5099.11 - : California Outdoor Recreation Department Resources Plan Act - Provides for state and local participation in federal assistance programs under the Land and Water Conservation Fund Act of 1965

b. Sections 5001-5019.5 - Scope: State Park System - The Department of Parks and Recreation shall administer, protect and develop the state park system for the use and enjoyment of the public.

4. Revenue and Taxation Code

a. Sections 895-897 - Scope: Scenic Areas Adjacent to Highways - Provides for state acquisition of scenic lands adjacent to state highways, provided federal funds are used for this purpose.

c) Acquisition of land by Peralta Junior College District

1. Advantages

a. College needed

b. Would cost city nothing

2. Disadvantages

   a. Would not produce revenue

   b. Not centrally located for a Junior College

   c. Does not give maximum use value of land

3) Federal Government

a) HUD 3 in 1 Plan. HUD's programs for open space land, urban beautification, and historic preservation are to be consolidated into a single program of grants for acquisition and development of open space land in urban areas. In a new provision, grants of up to seventy five per cent can be made to state or local agencies for acquisition of interests in undeveloped or predominately underdeveloped land, which if withheld from commercial, industrial, and residential development, would have special significance in helping to shape economic and desireable patterns of urban growth..." (Conservation Foundation Newsletter, Dec., 1970) We have limited knowledge regarding this plan but Parks and Recreation Dept. Director Walter Toney is well informed on it)

1. Advantages

   a. Defrays three-quarters of the purchase price

   b. Guarantees the maintenance of open space in the community

   c. Would "buy time" without capital outlay (more precisely, perhaps the city could purchase the land at some future date from HUD)

2. Disadvantages

   a. Potential uses are limited under HUD's jurisdiction

   b. Negates local control significantly

   c. Open space would probably not produce revenue

b) Tax Credit Plan (provides for the outright purchase of the land by the federal government through an act of Congress).

1. Advantages

   a. Resolves completely the problems of local financing

   b. Some precedent available

   c. Could initiate a more specific precedent for the acquisition of other privately owned, bay-shore properties

2. Disadvantages

   a. A lengthy process with only limited chances for success

   b. Possibly will remove land from local control

   c. Land's future becomes dependent upon the nature of the agency which is chosen to administer it

   d. Further time delay may be undesireable

c) Funds may be available from various federal agencies for specific use projects.

1. Federal Laws

   a. Public Law at98 Oct 29,1969 p. 150 - Land and Water Conservation Fund - oriented toward acquisition and development of undeveloped land - has $400 million available for 1972 (as compared to $200 million in 1970) Payments to states are to be matched with an equal amount by states themselves

   b. Section 2(d) of the act of Oct 15, 1966 (80 Stat. 926; 16 U.S.C. 66 8bb (d) is amended as follows: "The Secretary is authorized to acquire by purchase, donation, exchange, or otherwise any privatd y owned land, water, or interests therein...for the purpose of conserving, protecting, restoring, or propogating any selected species of native fish and wildlife that are threatened with extinction and such acquisition shall be administered in accordance with provisions of law applicable to such areas, there is authorized to be appropriated annually for fiscal years 1970-1972 not to exceed one million to carry out the provisions of this sentence.

   c. Public Law 90-401 July 15, 1968 Section 8 - Not to exceed $30,000,000 of the money authorized to be appropriated from the fund by Section 3 of this act may be obligated by contract during each fiscal year 1969-1975 for the acquisition of lands, waters, or interests therein within area specified in section 6(a).

      Section 6(a): Facilities used or useful for outdoor recreation or which furnish services related to outdoor uses.

   d. Note: Many more Federal Laws are applicable to the situation. We suggest the city council research the alternatives.

B. Private

1) Allow the sale of the properties in question to private developers who would be required to use them for some specified use (i.e. a conference or convention center).

   a) Advantages

      1. Incurs no expense to the city
      2. Revenue producing
      3. Creates jobs
      4. Not necessarily "commercial" in effect or necessarily damaging to the waterfront ecology (Depends largely on conditions of sale and development).

   b) Disadvantages

      1. Potential for extreme long-run damage to the waterfront
      2. Use might be limited to a certain segment of the population
      3. Possible harm to existing commercial enterprises
      4. Possible adverse effects of further economic and population growth on local community

The acquisition of the afore-mentioned land, located at the foot of university Avenue, may be made possible by several types of public finance. These possibilities include, 1) municipal bonds, 2) revenue bonds, 3) long-term lease with option to buy, 4) trade of other city properties for the Marina lands, or 5) special legislation by the Federal Government in the form of a Federal Corporate Income Tax credit. It should be noted, however, that these are not the only available means of funding for the acquisition of land for public use.

Many state and federal laws deal directly with the question of land acquisition for public use, and these may also be used as a viable means to accomplish the public acquisition of land.

At present, the city of Berkeley has the highest property tax rate in the nation. For this reason, floating municipal bonds to raise capital for the acquisition of this land, might well be a mistake. To finance the bonds, either an increase in the tax base or an increase in the tax rate will be necessary, which will put an unfair burden upon property owners in the city. The voters will, for this reason, coupled with the fact that a two-thirds majority is needed to pass such a bond issue, surely defeat any such legislation put on the ballot. If a bond issue should pass, this would guarantee the funds necessary for the purchase of the land.

Depending upon the type of development that is approved for the Marina land, a revenue bond measure would certainly get the voters approval. There would be no increase in taxes, for the bonds are sold upon the assumption that the type of developement recommended for the Marina land would generate enough revenue to pay off the bonds. Furthermore, private individuals would probably purchase the bonds, thus eliminating the bond issue entirely from the public sector.

Apparently the city of Berkeley has never before tried to acquire land with a long term lease with an option to buy. It has been highly when used by other municipalities. Once the city negotiates a contract with the present owner for a long term lease with an option to buy the land, the present owner may then sell the lease for the full cash value of the land to an independant land holding company. The city is able to purchase the land with a minimal annual cash outlay, because the purchase price is amortized over a long period, providing the city with small payments. Even though this does allow the present owner to obtain maximum profit from the land, while at the same time allowing the city to purchase the land, the final purchase price of the land to the city has greatly increased due to finance costs. What must be emphasized here, is the question of whether the city feels the new or final purchase price is indeed fair and equitable to all the residents of Berkeley.

Trading public land for another parcel presents some complex problems, which may suggest a better alternative. For example, are both parcels equally valuable in the light of plans for future use and development? Even if the values are determined to be equal, does the owner of the Marina land want to

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UNIVERSITY MICROFILMS

Revenue Bonds

The most important device used by local governments to avoid debt limitations has been the revenue bond, or sometimes called "the nonguaranteed bond." Strictly defined, revenue bonds are those for which interest and principal are payable exclusively from the earning of a specific enterprise. In such case they are not serviced from the general revenues of a local government; they are not, therefore, subject to the constitutional or statutory limitations imposed on the issuance of full faith and credit bonds.

In their present use, revenue bonds are mostly issued to finance revenue-producing enterprises - public utilities, toll facilities, sports complexes and so on. This is an appropriate use. When the borrowing of a commercial enterprise, publicly owned and operated, is backed by the full faith and credit of a state or local government, a lower interest rate is obtained. The governmental guarantee is a protection to investors against default, and the enterprise had to earn less to meet interest charges than if the guarantee were not given. The contention that this differential is a subsidy may be met by the contention that a public enterprise is entitled to use of public credit. So long as no tax support is needed, the enterprise may, perhaps, be regarded as self-supporting.

Current methods of borrowing by revenue bonds are: (1) use of revenue bonds by state agencies or by local government; (2) creation of a public authority with power to issue revenue bonds for a specific purpose; (3) lease-purchase agreements, usually combined with creation of a public authority; and (4) delegation of state functions into local subdivisions that have more freedom to borrow, with reimbursement by the state.

There are three types of projects which arise from revenue bonds: Self-Financing Projects; Non-Self-Financing Projects and; Industrial Aid Projects. When a project is self-financing, the price, toll or fee charged for the service includes the cost of servicing the debt, and this cost will be higher than if guaranteed bonds were used. Avoidance of a guarantee may serve to protect the credit of the governmental unit. When a project is not self-financing use of nonguaranteed bonds cannot avoid placing an indirect or direct burden on the revenues of local governments.

Revenue bonds can be used to aid private industry. In over forty states, local governments have been authorized to issue revenue bonds in order to acquire land, buildings, and equipment that are leased to private firms. The firms pay a rental to cover servicing of the debt.

There are two grave shortcomings of revenue bonds. The interest rate on non-guaranteed bonds has been .5 - .6 per-cent higher than that on full faith and credit bonds. An increase of .5 per-cent in the interest rate of a thirty year level-payment serial bond raises aggregate interest cost by 19 percent. The reasons for higher interest on revenue bonds is because non-guaranteed bonds are issued for a longer time period than most general obligations bonds because of a desire to provide "a safe margin for coverage of costs and debt changes."

The most serious present danger arises because non-guaranteed bonds are not self-supporting and which, therefore, burden the budgets of local governments.

FUNDING OF THE PURCHASE OF BERKELEY'S WATERFRONT LAND BY EAST BAY REGIONAL PARKS:

East Bay Regioaal Park's would be a good funding source for the purchase of the Murphy Property if the land is to be developed as a park and recreational facility. Through investigation we have found out from those in charge of Land Aquisition with EBRP that a sum of money from next year's budget has been set aside for the purchase of land along the Crescent Area(land extending from Richmond to the Bay Bridge along the waterfront). The people at EBRP couldn't tell us which land in particular they were intending to buy for fear that land speculators would purchase lands all along this area which might serve to inflight the price and/or value of the land in this area.

If a variety of sources are available for the funding of this venture EBRP might be the most preferable agent for they are within closer contact with the people(interests) and the Ecology of the Bay Area than federal or national agencies. In addition to this EBRP employs people with expertise in a wide variety of fields e.g., soils experts, plant biologists, architects, land managment experts etc. These people would probably be the most able to build a park and recreational facility taking into account all ecological and developmental factors and problems.

II. Alternate Uses

A. Completely Undeveloped Open Space

1) Advantages

a) One of the few available areas with the potential for public recreation on the East Bay shore.

b) Use as open space would allow for further consideration as to the future use of the land and at the same time prevent immediate over-development.

c) Would require little investment for development.

d) Would provide a sanctuary for plants and animals not normally found in developed areas.

2) Disadvantages

a) Shows little potential for immediate use by the general public.

b) Land is not really a natural area due to physical factors such as soil quality, and its location near the freeway.

c) Would contribute no revenues.

B. Semi-Natural Park

1) Advantages

a) Would hasten development of natural recreational facility by augmenting natural plant succession.

b) Basically same advantages as open space use.

2) Disadvantages

a) Would contribute no revenue.

b) Although probably of greater use to the general public than undeveloped open space, we cannot be sure that it will fulfill the needs and desires of more than a small segment of the population.

c) Our information suggests that the land as it now exists would not support anything other than small plants and shrubs.

d) Even this type of development would be relatively expensive.

C. Fully Developed Park (incorporating play grounds, fields, Picnic facilities, bike paths, etc.)

1) Advantages

a) With the exception of Aquatic Park the West Bay area is lacking in developed recreational facilities.

b) Would offer use to large segments of the population as it is centrally located to three Bay Area counties.

c) Preserves a "semi-natural" environment.

d) Under state administration, more funds might be available for development and maintenance.

2) Disadvantages

a) Requires capital outlay for development and further outlay for maintenance.

b) Contributes no foreseeable revenues.

c) Poor weather conditions. (often cold)

d) Various problems with the land itself. (i.e. poor drainage, settles erratically, etc.)

e) Any new, large development requires increased police and fire protection.

D. Cultural Center (theatre, meeting rooms, display facilities)

1) Advantages

a) Would provide cultural outlets for groups which do not normally have access to such facilities.

b) Would likewise provide outlets for local talent.

2) Disadvantages

a) Large capital outlay with little possibility for revenues.

b) Costs and problems involved in constructing large buildings on fill land.

c) Necessity for parking facilities.

d) Increased police and fire protection.

E. Craft Center/Farmer's Market (low rent facilities built and maintained by the city)

1) Advantages

a) Outlet for area's numerous craftsmen and track farmers.

b) Good potential for long-term revenue.

c) No direct competition for existing commercial →

enterprises.

d) Gives access to low cost food and hand-made products.

2) Disadvantages

a) Requires large capital outlay.

b) Necessity for parking facilities and access for increased traffic.

c) Doesn't necessarily fulfill the needs of the entire community.

d) Incomes subject to seasonal and yearly variations.

e) Further outlay for maintenance.

F. Conference Center

1) Advantages

a) Need for informal meeting facilities in the Bay Area.

b) Potential for directed private investment.

c) Increase in tourism and local trade from conventions.

d) Direct revenues for the city.

2) Disadvantages

a) Large capital outlay.

b) Of questionable utility to the average Berkeley citizen.

c) Necessity for parking facilities.

G. Garbage Seperator-Recycling

1) Advantages

a) Disposal of garbage at a profit.

b) Useful to all residents.

c) Good example for other communities.

2) Disadvantages

a) Location of land makes it more valuable for recreational and water-related uses especially when industrial land is available.

H. Golf Course

1) Advantages

a.) Revenue producing.

2) Disadvantages

a) High maintenance and development costs due to poor land quality.

b) Adverse weather conditions.

c) The location of the land would make it more suitable for use by the general public rather than a small segment of the population.

I. Peralta Junior College

1) Advantages

a) Development of land with out cost to the city.

2) Disadvantages

a) Would produce no revenues.

b) The location is perhaps not suitable for a junior college.

J. Multi-Use (similar to a combination of C, D, E, and F above)

1) Advantages

a) Would satisfy a broad spectrum of needs and desires within the community.

b) Revenue producing.

c) Would prevent over-development without inhibiting efficient, sensible use of a potentially valuable community resource.

d) Possible special funding (public and private) to defray developmental costs.

2) Disadvantages

a) Large capital outlay.

A cultural center incorporating an auditorium, meeting rooms and display facilities would fulfill the needs of a number of groups in the Berkeley community. A center of this sort could be an outlet for various cultural and ethnic groups allowing for presentations of plays, movies, and other cultural and educational events. The entire local community could benefit from the increased expression of its various members.

The display facilities could be used to inform the public on various community issues or to educate the people on subjects from black history to organic gardening.

The center would also provide meeting facilities for Berkeley's many cultural and political groups. The facilities could be made available at little or no cost to those who might not normally be able to afford them.

This plan is an expensive one for the city, especially considering the problems involved in constructing large buildings on this land and the fact that there appears to be little chance of a cultural center returning any significant revenues to the city.

Perhaps more than anywhere else in the country, the Bay Area has a substantial population of artists, writers, craftsmen, etc. who have chosen to seek their livelihood in an unconventional manner. That is, they are disadvantaged in the marketplace when forced to compete with more typical commercial enterprises. Probably the greatest problem faced by these individuals is the absence of adequate facilities in which to work with, display and sell their products. (Recently, especially in San Francisco, these problems have been compounded by various legal hassles.) It is also reasonable to assume that if such facilities were available many more persons might be encouraged to share their skills as artists and craftsmen with the consuming public. Finally, their seems to be a proven demand for works of art and hand-crafted goods. Consequently, one possible use for the Marina lands might be to build a craft center which would resemble a permanent Renaissance Fair.

This alternative suggests that the City of Berkeley build and maintain several, low cost booths or shops which would then be made available to craftsmen and artists either at low rent or upon a percentage of sale basis. Such a center would solve the problem of the craftsman while creating a unique cultural and economic attraction. Considering the increasing demand for fresh fruits and vegetables in the Bay Area, such a facility might incorporate a farmer's market where truck farmers and organic gardeners from local and surrounding areas might come to sell their goods directly to the public.

Certainly there is a rather large amount of money involved in building such a facility but the expense must be viewed in relative terms. For instance, such structures needn't be elaborate. In fact, simplicity and a rustic appearance would compliment the waterfront environment. Perhaps more serious than the expense involved would be the traffic and parking problems created if the craft center/farmer's market were successful. Still, with careful planning, such problems might be overcome by using shuttle buses or existing AC Transit facilities. If it selects this alternative, the council should also remember that such a development could only cover a limited part of the large area available for use. Similarly, such a development might only cater to the needs of a limited segment of the population. (i.e. Their is always the danger of such a development becoming a tourist trap like Sausilito or Carmel to the detriment of the community at large.)

The development of this area into an informal Asilomar type conference center would supply the Bay Area with an alternative to the "convention center" type facilities that presently exist. A number of buildings seperated by landscaped grounds would provide a more "natural" and low key atmosphere in which local groups and organizations may hold meetings.

Local businesses would benefit from the increased tourism and local trade while the city would receive increased tax revenue from the development.(One must consider though that economic gains of this sort are not always what they may seem. The demands made by new development, such as increased public services, and indirect effects on the community, can result in increased financial problems in the long run.)

Aplan of this sort has good potential for private development and as such would relieve the city of the burden of developing the land. However if for some reason private investment was found to be unavailable or not in the public's best interest this plan would be a fairly expensive one for the city to carry out.

One might also question whether this land might be better used in some manner that would allow for more direct use by the people of Berkeley.

Appendix-II.,I (Multi-Use)

The main advantage of a combination park/multi-use complex on the Murphy-Santa Fe property is its appeal to a broad spectrum of the community. Most of the other possibilities seem too restricted either from the aspect of long-range community benefit, (In the past it has been demonstrated that economic 'growth' in a community usually results in quantitative growth as opposed to qualitative growth.), or from the aspect of immediate community benefit, (The people who need most to benefit from economic growth are the ones most often neglected.). The type of facilities that a multi-use/park complex could provide would serve not only as a source of income, but in addition would effect a stimulous for community interaction which in turn would stimulate a qualitative growth within the community.

A multi-use facility could be a simple structure such as a geodesic dome, (one of the least expensive yet totally functional structures available) that would be relatively unstructured on the inside. The dome itself would allow for an expanded period of use as the weather is too harsh for year-round community utility of the property. The relatively unstructured nature of the inside would allow for such diverse uses as: a community meeting place (for social, political, spiritual, or educational purposes), a "Renaissance Faire"-type market place (handmade products sold by local craftsmen), a "Farmer's Market"-type market place, a craft center, a job-training center, etc.

Approximately 90% of the land would remain structurally undeveloped and would have the potential for development as a tree-filled park, sheltered from the freeway by berms (as suggested in the "Recreational Concept" proposed by the Citizens for a Waterfront Park) This park could not only be aesthetically uplifting and ecologically constructive, but would prevent immediate over-development without necessarily restricting future potential. In addition, areas could be designated for community and/or individual organic and experimental gardens.

The only prominent disadvantage to this type of development would be the high cost of the development itself, aside from the original purchase costs, and the outlay for maintenance. However, these costs could possibly be offset by the income-producing activities (trade fairs, plays etc.) and by Federal or State use-related funding. In addition, zoning the Murphy-Santa Fe property for this type of development would effectively lower the asking price.

Purpose of the Survey

The purpose of our public opinion survey of Berkeley residents was to determine the opinions and attitudes of the people of Berkeley over the utilization and acquisition of the 84 acres of Marina land. Through the use of the survey, we hoped to be able to determine the following things:

1. Whether the people of Berkeley are aware of the controversy over the Marina land in question.

2. Whether the people of Berkeley want the land developed by private interests or purchased by either the Federal government, the state government, or the City of Berkeley.

3. Whether the people of Berkeley wanted the land to be developed, and if so, as what.

4. Whether the people of Berkeley are willing to pay for the land (either by an increase in their property tax or in the case of the educational question, by school bonds.

Survey Technique

Our source was the reverse telephone directory. We took the section which was divided alphabetically into the streets of Berkeley (pages 34-87). From a table of random numbers (printed by M.G. Kendall and B.B. Smith, J.R. Statistics), we randomly selected 40 pages to be chosen for a list of 40 names. Since each page was divided into six columns, we then randomly picked the numbers one through six to be assigned to each given page number. We then randomly selected a number on the column to be our subject. For example, if we picked 47, we moved 47 spaces down the column and then chose that address. To make our statistics accurate, every address was used.

How the Questions in the Survey Were Organized

The questions in the survey were composed in such a manner that all possible preferences could be included. Such structure made the survey necessarily broad. In avoiding too general an approach, question three was subdivided. People who were interviewed were allowed to pick three or less options in question three and then asked to answer the specific questions listed under their three choices. This arrangement allowed for a short interview but with specific answers for each option. At every level of the question, space was provided for preferences not listed or for a no opinion answer.

Procedure of Questioning

The technique used was door-to-door direct questioning. Upon answering the door, we informed the person that we were a U.C. student and a member of a class conducting a public opinion survey on the Berkeley Marina. We asked them if they would mind answering a few questions concerning the Berkeley Marina. We made sure that the person was eighteen or over and a resident of Berkeley. We then proceeded to ask the person answering the survey the questions. We let the person have three choices for each question if they so desired. For question three on page one, we turned to the specific category or categories chosen by that person and asked them only those specific questions under that category. If a person did not answer the door after two attempts on different occasions, then we went next door to question that person using the preceding format.

V. Tabulating the Data

For each question that had a "Yes" or "No" answer, tabulating the number of "Yes" responses and "NO" responses was relatively easy. Each "Yes" vote counted as one vote and each "No" vote counted as one vote. The total number of votes for either "Yes" or "No" was determined by adding up the respective unit votes from each separate questionaire. However, a problem arose in trying to tabulate the votes in a question that had multiple choice answers (eg. Question #3). For this type of question, when a person had more than one preference, his vote was divided equally between the number of preferences he chose. For example, in question #3 on the first page where there were 9 possible responses, a person could divide his vote for any or all of these 9 choices. If, for example, a person chose A, B, and C as his preferences, his vote would be divided into thirds, with each choice receiving a third of a vote. Similarly, if a person chose D and E as his preferences, his vote would be divided into halves, with each choice receiving half a vote. If a person had only one preferecence then his vote would count as a whole vote for that particular choice. In tabulating all the data from our 40 questionaires, we simply added up all the votes or parts of votes for a certain choice and the sum was the total number of votes for that choice. By calculating a person's preferences in this way, each person's preferences (or choices) were equally represented in the total. After adding up the totals for each question and each choice, we changed the number of votes into a percentage of the total number of votes dividing the total number of votes for each choice by the total number of votes in each question. For example, in question #3 on the first page, if there were 6 total votes for choice A, 4 total votes for choice B, and 0 total votes for the rest, then choice A's percentage of the total vote would be 60% and choice B's percentage of the total vote would be 40%. This is determined by adding up the total number of votes for each choice which in this case would have been 6+4=10. Then by putting 6 over 10, we get the percentage for choice A and by putting 4 over 10 we get the pereentage for choice B. We used this method to determine the percentage of each vote throughout the survey. The one major problem in the tabulating of the survey was that we did not take into account the order of preference for multiple choice answers. Instead of having a first, second, and third choice for each question, we had each choice count the same. This may cause the survey's conclusion to be slightly incorrect, in that each choice will not be representative of the order of preference.

One half (20) of the people interviewed were asked to show their first three preferences. Of these twenty, ten (50%) chose recreational use as their first choice and four (20%) chose recreation as their second choice. Within the group that chose recreation as their first choice, eight preferred the category Developed park with facilities. In other words 40% of the total preferred the Developed park with facilities category and two people (10%) chose the open space park category. 10% chose open space park as their second choice.

The following list shows the first, second, and third choices of twenty of the people interviewed. Some of the people did not care to list a second or third choice.

	1st choice	2nd	3rd
Recreational Use	50%	20%	0%
Commercial Use	15%;	0%	10%
Cultural Use	10%	10%	10%
Educational Use	0%	15%	10%
Housing Use	0%	5%	0%
Public Service Use	5%	0%	5%
Open Space Use	5%	15%	5%
Other (revert to mudflat)	5%	20%	0%
No opinion	10%	0%	0%

Appendix 2

We attempted to make a survey of the churches in south and west Berkeley concerning the Marina. However out of the first six ministers that were phoned, four stated that they felt unqualified to make any kind of statement. The survey was abandoned since at best it was subject to biaseness and with so few ministers responding it would have been meaningless.

Survey Evaluation

Out of a total of 40 residents,43% wanted the land used for recreational purposes. The closest second choice, which was 26% less than the first choice, favored the land being left as open space. From the 43% desiring recreational uses, 38% wanted an open space park, while the second closest choice, which was 26% less than the first choice, was arts and crafts instruction at the recreational site.This trend might represent a need for the recreational site to be a combination of open space and arts and crafts facilities.

From 61% of those desiring recreation, all agreed to purchasing the land for recreation, even if meant an increase in their property taxes. From the 17% of residents desiring the land to be left as open space, 64% agreed to purchasing the land even if it meant an increase in their property taxes. It might be added that in every case, the majority of those interviewed agreed to pay a tax increase in order to purchase the Marina Land.

54%, over one half of those interviewed, desired the land to be purchased by the City of Berkeley(local government), while the closest second, which was 26% less, had no opinion.

Since 62% of those interviewed were renters, we chose to break down our survey and look at the homeowner trends separately. The homeowners accounted for 38% of those actually interviewed. In this case, 67% were aware of the present controversy over the Marina Land whereas 51% of the total residents had been aware. 60% of the homeowners wanted the land to be purchased by the City of Berkeley(local government) which shows the same favoring trends of the total residents.

33% of the homeowners wanted the land used for recreational purposes, while the closest second, which was 14% less, wanted the land for commercial purposes. From the 33% of homeowners desiring recreation, 50% were in favor of a tax increase, and 10% had no opinion. From the 19% of homeowners favoring commercial uses, 67% desired the development to be revenue producing for the City of Berkeley, and 33% were against this.

Comparing the total residents to the homeowners in the taxing trends, we found:

A. Recreational Use

Would you favor the City of Berkeley purchasing the Marina Land even if it means an increase in your property taxes?

Total residents Yes 61% No 29% No Opinion 10%

Homeowners Yes 50% No 40% No Opinion 10%

B. Commercial Use

Do you want the development to be revenue producing for the City of Berkeley?

Total Residents Yes 75% No 25% No Opinion____

Home Owners Yes 67% No 33% No Opinion____

C. Cultural Use

Total residents Yes 75% No 25% No Opinion____

Homeowners Yes 60% No 40% No opinion____

D. Educational Use

Would you vote for a bond to acquire the land and build the school?

Total Residents Yes 72% No 14% No Opinion 14%

Homeowners Yes 66% No 17% No Opinion 17%

E. Housing

Should the housing be publically owned?

Total Residents Yes 66% No____ No Opinion 33%

Homeowners Yes____ No____ No Opinion____

F. Public Service

Would you favor the city of Berkeley purchasing the Marina Land even if it means an increase in your property taxes?

Total Resicents Yes 75% No____ No Opinion 25%

Homeowners Yes____ No____ NO Opinion____

G. Open Space Use

Would you favor the City of Berkeley purchasing the Marina Land even if it means an increase in your property taxes?

Total Residents Yes 64% No 27% No Opinion 9%

Homeowners Yes 50% No ____ No Opinion 50%

In brief, the major trends of both the total residents and the catergorized homeowners indicate a desire for recreational use with the site being part openspace and part facilities for arts and crafts. The second major trend for the total residents is openspace, while the homeowners favor commercial use. Both groups agree that the land should be purchased by the City of Berkeley (local government), and both are in agreement in favoring this purchase even if it means an increase in their property taxes.

The major trend seems to be for something that can be used by the public. Besides recreation, the homeowners had a second highest trend for commercial use, and the total residents, in comparison, favored commercial recreation, a shopping center, and arts and crafts in the commercial use catergory, all of which are publically used areas. Both highest trends for both groups favored recreation with a tax increase proposed by the local government, and it is on this basis that we recommend the Marina Land be purchased for recreational use. We also feel that since the residents favored an open space park and arts and crafts facilities, the site should be planned with both these interests in mind to serve the public.

A. RECREATIONAL USE

1. Which of the following recreational uses would you prefer at the Marina Land:

38% A. Open space park

4% B. Developed park with facilities

2.1% C. Indoor sports facility

1.1% D. Commercial recreational facility

12.0% E. Arts & Crafts Instruction

5.4% F. Other (please specify) Parking, Swimming Pool

0 G. No opinion

2. Would you favor the City of Berkeley purchasing the Marina Land even if it means an increase in your property taxes?

61% YES 29% NO 10% No opinion

B. COMMERCIAL USE

1. Which of the following commercial developments would you prefer at the Marina Land:

0 A. Heavy industry

4% B. Light industry

0 C. Office complex

26% D. Shopping center & stores

20% E. Arts & crafts sales center

0 F. Farmers market

16% G. Restaurant

24% H. Commercial recreation

0 I. Research center

6.3% J. Convention center

0 K. Other (please specify) ____________

0 L. ~~XXXX~~ No Opinion

2. Do you want the development to be revenue producing for the City of Berkeley?

75% YES 25% NO 0 No opinion

C. CULTURAL USE

1. Which of the following should the cultural center contain:

21% A. Arts & crafts center

30% B. Concert and lecture hall

0 C. Movie theater

14% D. Community meeting center

17% E. Minority history and culture center

13% F. Other (please specify) Stage, Dance Hall, Bay Ecology Center

0 G. No opinion

2. Would you favor the City of Berkeley purchasing the Marina Land even if it means an increase in your property taxes?

75% YES 25% NO 0 No opinion

D. EDUCATIONAL USE

1. Which of the following types of educational facilities would you prefer:

21% A. Junior college

21% B. State college

0 C. Berkeley public school

29% D. Vocational trade school

0 E. Private school

0 F. Other (please specify) ____________

29% G. No opinion

2. Would you vote for a bond to acquire the land and build the school?

72% YES 14% NO 14% No opinion

1. What kind of housing facilities do you prefer:

33% A. Houses

50% B. Apartments

0 C. Hotels

17% D. Youth hostel

0 E. Other (please specify) ____________

0 F. No opinion

2. Should the housing be:

43% A. Low cost

33% B. Middle cost

0 C. High cost

10% D. Free

10% E. Other (please specify) donation

0 F. No opinion

3. Should the housing be publicly owned?

66% YES   0 NO   33% No opinion

F. PUBLIC SERVICE

1. What type of public service facilities do you prefer:

12% A. Child care center

2.0% B. Ecology and recycling center

7.5% C. Job training and placement center

25% D. General counseling and information center

33% E. Free clinic and health center

0 F. Library

0 G. Other (please specify) ____________

0 H. No opinion

2. Would you favor the City of Berkeley purchasing the Marina Land even if it means an increase in your property taxes?

75% YES   0 NO   25% No opinion

1. Would you favor the City of Berkeley purchasing the Marina Land even if it means an increase in your property taxes?

64% YES 27% NO 9% No opinion

Costs for building any medium to heavy structure on the filled land that we are talking about would be extremely high. First, the land itself consists of basically three types of clay, ranging from loose to very dense, garbage filled with soil areas, and Bay Mud. To construct a building on this type of land, many precautions would have to be taken. the settlement of the garbage filled areas is very unpredictable and erratic. This erratic settlement of the "soil" would have to be tested for months before any structure could be build because it would be vitually impossible to make any calculations as to what the land would do. Also, to insure the stability of the land a surcharge or preload fill would be wise to place on the surface to get a better idea what the land will do under heavy loads. These are all precautions that would have to be taken, that would run into time, and that should come to your attention.

To place a medium to heavy building on this land, pilings ranging anywhere from fifty feet or more would have to be installed because of the Bay Mud. These pilings will cost anywhere from \$3.00 to \$7.00 and hundreds would have to be installed if any large structure were placed there. To reinsure the stability that these pilings are supporting, Dames and Moore, Consultants in Earth Sciences, recommend that an engineering fill replace the existing garbage fill. Since the garbage fill goes down, in some places, fifteen feet, and possibly twenty-two, quite a bit of fill would be necessary, and at \$.50 to \$1.50 per cubic yard of fill, the expenses for constructing would be costly.

With this type of "soil", maintanence costs would be relatively high. Corrosive resistent material for the utilities would have to be installed and the erratic settlement conditions would make street maintanence far above normal street mainanence. There is also a big problem with drainage. This piece of land has irregular heights that will cause a problem if any sizeable amount of water should accumulate.

Two other minor considerations to keep in mind if any construction takes place:1)There is methane gas in the garbage fill and if these gases find their way into the electrical conduits, which they have been known to do in the past, an explosion could take place, and 2)There will be a temporary rank odor in the air once this fill has been exposed to the air.

The Berkeley Police Chief, B.R. Baker, has stated that if a shopping center goes up, depending upon the number pf private security guards, an increase in patrolman would have to be made. The increase was said to be from two to six patrolman. If some other type of construction*, or for that matter almost any type of developement, goes up, an increase in patrolman should be expected; which means more city taxes. Likewise, for the Berkeley Fire Department, Fire Chief, G.R. Porter has stated that an additional fire station would have to be built in West Berkeley to meet the new fire risks brought on by the shopping center. So the same would probably hold true for the fire department as did for the police department: any substantial new developement would constitute increase protection and, consequently, increase city taxes.

* Here I am referring to some construction that would necessarily constitute and increase in patrolman. I am not stating that <u>any</u> type of construction <u>will</u> constitute this increase.

TRANSPORTATION

I. Automobile

A. Advantages

1. It is quick and convenient.

2. Commuters have ready access.

3. It is revenue producing from parking.

B. Disadvantages

1. It may produce traffic and/or parking congestion.

2. Parking lots take up valuable needed space.

3. It is less aesthetic and natural to the waterfront.

4. Interstate 80 interchange, University Ave. overpass, Marina Blvd., and West Frontage Rd. need further improvements to accommodate anticipated future usage.

5. It may cause major long term irreversible damage to the waterfront.

6. Usage is limited to automobile drivers (maximum restriction to children and other non-drivers).

7. It contradicts the current trend to alleviate noise and air pollution.

II. Bus

A. Shuttle bus

1. Advantages

a. It can be quick, convenient, and relaxing.

b. It eliminates some of the private vehicle usage (especially on the short distant trip).

c. More children, non-drivers, and poor people can make use of the waterfront.

d. It utilizes waterfront space in parking and etc. more efficiently.

e. It can be ideally convenient to connect with Rapid Transit.

2. Disadvantages

a. Shuttle buses may at first add a new expenditure to Berkeley.

b. It can be in competition with existing AC Transit Busing.

c. It has limited area coverage.

d. Added shuttle bus pickup stops require the loss of parking spaces on existing streets of Berkeley.

e. Normally one is fairly distant from nearest pickup stop.

B. AC Transit Bus Line

1. Advantages

a. Since AC Transit has existing buses and drivers, it minimizes initial costs and investments (at present, there is one route already to the Berkeley Marina).

b. AC Transit is accessible from most Bay Areas.

c. A larger percentage of the poor, non-drivers, and children can have access.

d. It eliminates some of the private vehicles, thus relieving traffic congestion.

e. It is relaxing.

2. Disadvantages

a. There is unneccessary pollution from empty or near empty buses on route.

b. People with automobiles do not tend to use this facility.

II. Bay Area Rapid Transit

A. Advantages

1. It is quick and convenient for commuters.

2. There is less commuter auto traffic and congestion.

3. It can be conveniently used in conjunction with AC Transit and/or with shuttle buses.

4. BART station on Sacramento St. and Virginia St. is relatively accessible to Berkeley's waterfront.

5. Berkeley's waterfront access is maximized.

B. Disadvantages

1. Timetable must be met

2. Buses will not run at all hours

V. Non-motoring

A. Bicycle

1. Advantages

a. Berkeley's waterfront can adapt with the increased popularity of bicycles.

b. This adaptation can be made economically in conjunction with normal construction.

c. Berkeley can take advantage of a recently passed State bill allocating funds for bicycle paths.

d. Bicycling is nonpolluting to waterfront.

e. Less space is taken up with paths and bicycle racks than auto parking lots, street widening, and etc.

f. This adaptation offers "safety" to the bicyclist.

2. Disadvantages

a. It requires much needed funds to change the Interstate 80 interchange and University Ave. overpass to accommodate bicycle paths and cages.

b. At present, it is not too feasible to ride bikes in the Unversity Ave. district because of the many autos.

c. There is a limited number or group of people who use bicycles.

d. It can discourage commuter usage.

e. There are weather/climate restrictions.

B. Pedestrian

1. Advantages

   a. It provides an excellent means of exercise.

   b. It encourages local usage.

   c. It is nonpolluting.

   d. It requires no "parking" problems.

2. Disadvantages

   a. It is not feasible to cross University Ave. overpass without expensive improvements by the State or whoever.

   b. It is too distant or time consuming for many people.

   c. It can be dangerous under present conditions for children and other people.

   d. It is not in a residential area.

   e. There are climate/weather restrictions.

   f. There are people who would not walk a block to the neighborhood store.

TRAFFIC CONGESTION

Circulation elements of the waterfront are going to be based on whatever this area is going to be used for. It will most probably result in a combination of the different methods of transportation outlined. Whatever, access to, from, and around the waterfront should be quick, frequent, and convenient under local as well as commuter usage. It should be as natural and aesthetic to the waterfront as possible. There should be emphasis limiting the use of private automobiles because congestion and pollution are major factors causing long term damage to the waterfront. Since Berkeley is fortunate enough to have Rapid Transit, it should make the most of this by adequately connecting this service with the waterfront as well as with other areas (e.g. Aquatic Park) of Berkeley. This can be accomplished with either the existing AC Transit or maybe a a new shuttle busing system. Berkeley should encourage non-motoring means of transportation. It can adapt with this increased popularity with the help of a recently passed State bill on the promotion of bicycle use. Pedestrian and bicycle ways should provide safe and aesthetic access to and in all areas of the waterfront. If private vehicles were made inconvenient and public and non-motoring means were encouraged, damage to the waterfront's "system" may be kept minimal. Additional means and research on transportation should be studied. Factual statistics for this outline has been hampered with lack of time.

INTERDEPARTMENTAL STUDIES 49

Introduction to Conservation of ~~Natural Resources~~

IDS 49 is an experimental course designed to orient the student and acquaint him with the broad range of problems in which he might become involved. It is intended primarily for freshmen and junior college transfers.

Basically, the course consists of three weekend field trips to areas in the state outside of the Bay Area. Although interesting aspects of the areas visited are pointed out and often discussed, the primary purpose is to discuss topics chosen by the students and the instructor. The range of topics is unlimited; anything from the grading system to birth control pills to the California Water Plan might be discussed.

The format and small class size afford the opportunity for students to get to know each other and faculty members very well. As the following shows, this communication benefits students and faculty alike.

INTERDEPARTMENTAL STUDIES 149

Senior Seminar in Conservation of Natural Resources

This course is designed for seniors in the Conservation of Natural Resources Field Major and should be taken the last quarter of the senior year. The course provides an opportunity for the student to synthesize an overview of their major. A one-hour oral presentation and a major paper (equivalent to a senior thesis) is required. Presently the class meets twice a week for one hour and two three hour meetings are held at the end of each quarter.

What motivated you to major in CNR? Why did you select the particular set of core courses that you took to satisfy your upper division requirements? Did the core courses provide you with the knowledge and experience that you expected to receive? What is your opinion of the courses that you took as a CNR major? What is your opinion of the CNR Field Major? How can the major be improved? Are you satisfied with the knowledge that you obtained in the major? What do you hope to do with this knowledge following graduation? What kind of jobs do you feel that you will qualify for following graduation? Students are encouraged to answer these and other questions relating to their personal experiences in the major.

IDS 149 has only been given once as of this writing. Students who took the course in Fall 1970 had many criticisms and suggestions to offer for future sessions. The format of IDS 149 will be changing as we learn more about what the students need from a senior seminar.

INTERNSHIP IN CONSERVATION OF NATURAL RESOURCES

The experimental internship course has now gone to the various committees who will need to approve it before it can become a formal department offering. The following description was included in the request for approval of the course:

This course is designed to bridge the gap between our freshman courses (CNR 49 and IDS 10) and our senior course (CNR 149). IDS 10 is designed to give the student a broad perspective on environmental problems while CNR 49 is designed to help the student find a direction within the broad area of conservation of natural resources. In CNR 149 the graduating senior attempts to synthesize his education to that point. At the junior level a course is needed to assist the student to define a specific goal-oriented area of interest and to evaluate that area realistically. The internship course is designed for this purpose.

The internship has three major objectives:

1) To provide students with the opportunity to do productive work related to their interests in a real-world situation. This allows the student an opportunity to measure his academic training and direction against the demands of a prospective career area.

2) To provide the agency, organization business or institution involved with tangible results from the student's time and efforts. The work must directly relate to natural resources and must be within the student's domain of interest.

3) To provide the student with a significant educational experience which will benefit not only the student, but also the university and the community.

The details of the internship will vary from one assignment to another, but the minimum requirements are as follows:

1) The student will provide an initial written statement which develops in detail his objectives in the internship.

2) The participating agency or organization will provide adequate supervision in the form of a single individual who will be responsible for the work of the student in residence.

3) One faculty member will be assigned to each student and will be responsible for advising and directing the student, assigning readings, and evaluating the internship at its conclusion.

4) The internship may be taken for 12 or 15 units of academic credit. The 12 unit option will be available only to some seniors who would be unable to take the internship unless allowed to enroll in one additional course, not to exceed 5 units.

5) At the close of the quarter, the student must provide a complete record and analysis of the work done while an intern as well as a bibliography of items read and a personal evaluation of the internship

as it has affected his education. For some interns, a personal history (diary) will be required to evaluate the learning process more concretely.

The enrolling student will be carefully matched with an appropriate position and with a faculty member with appropriate expertise. The student will be interviewed by both the agency and the faculty member to determine his or her acceptability to them. If accepted, a meeting between the student, faculty and agency supervisor will be arranged where communication will be established and the particular criteria for the internship will be determined. In addition to the initial meeting, the student must arrange a minimum of five contact times with the faculty member for advice and progress reports. At the end of the quarter a two to three hour oral evaluation will be made. If the agency supervisor is unable to attend this final evaluation, he or she will submit a written report on the student's efforts.

The course is primarily designed for juniors although some seniors will be allowed to enroll. Students will be discouraged from taking internships if it is felt that they do not have the motivation to carry through on their obligations or if they have shown a lack of ability to work independently.

The course was tested on a small scale in 1971-1972. It was highly successful and praised by the agencies involved as well as by the students and faculty. For your further information we have enclosed several reports from that experiment. We have also included the description of a similar course, now entering its fourth year at U.C. Riverside. We feel the justifications offered in that description apply equally to the proposed CNR internship.

NOTE: Both the internship reports and the correspondence with U.C. Riverside are available in the C.N.R. Office.

CNR 180, Internship Guidelines

The Internship in Conservation of Natural Resources (CNR 180) is a program under which students may spend one quarter working with an off-campus agency and receive 12 or 15 units of academic credit for their work and a paper resulting from the work. Application to the program is through an Internship Committee which will judge the applications according to the criteria outlined in these guidelines, which are for students who wish to apply for an Internship. Please read the guidelines and follow them carefully.

The Student

The student will be responsible for following the CNR 180 guidelines, which may be obtained from the CNR Office.

Students should consult their Major Advisor when first considering an internship, since the Major Advisor must approve the internship. The Major Advisor may also be a valuable resource in locating an agency and contacting a Faculty Sponsor.

The student should next prepare a detailed proposal of what he or she plans to achieve in the internship. This will aid in finding an appropriate Faculty Sponsor, if this has not already been done. (On locating a Faculty Sponsor, the student may get advice from the CNR Office, his or her Major Advisor, or anyone else.) The Faculty Sponsor should be someone who has an interest in the proposed area of work and should feel that he or she is competent to guide and evaluate a project in that area. The Faculty Sponsor must be a regular faculty member, not a teaching associate or assistant. It is the students' responsibility to insure that the Faculty Sponsor understands clearly what he is expected to do.

The student is responsible for locating an agency with which to work. The selection of an agency may be done in consultation with a Faculty Sponsor, Major Advisor, the CNR Office (which will maintain a file of agencies, but cannot guarantee matching an agency to every student), or other appropriate individuals at the University. The agency must be involved in activities which are directly related to the student's "area of interest" or academic focus.) The student is further responsible for making sure that the agency assigns him a qualified work supervisor. This should be determined in consultation with the Faculty Sponsor and/or agency representatives.

Prior to submitting the application, a meeting of the student, faculty sponsor, and work supervisor should be held. After that meeting, which may be a three-way phone conversation, everyone should be in accord with the purpose and work outlined in the internship. Criteria will also be determined at this time for the final evaluation. A statement of criteria for final evaluation must be submitted in writing by the student to be included with his application.

At this point a formal application for an internship may be made to the CNR Office. The application form will be available in the CNR Office. The application is to include:

1) the completed form
2) the student's written description of his or her "area of interest" or academic focus.
3) the student's written statement of objectives in the internship.
4) a statement of criteria for final evaluation.

Optional 5) the Major Advisor may include a supporting letter if it is thought necessary.

This application procedure must be completed <u>no later than six weeks</u> prior to the time the internship is to begin. Only now may the Internship Committee evaluate the application.

The CNR Office will forward the application to the Internship Committee who will approve or disapprove the internship. The internship will be evaluated on its academic merit and the student's chance of satisfactorily meeting his responsibilities.

<u>The Agency</u>

It must be emphasized that the Internship is not designed to place students in jobs, but as a learning experience for the student, comparable in scope to a full-quarter's course work on campus. The agencies participating in the internship will gain by not only the final product of the student's work (which often involves positions which cannot be filled through normal employment procedures), but through interaction with the student and access to the resources of the University.

The agency, in consultation with the Faculty Sponsor and the student, is responsible for providing a unit of meaningful, practical work for the intern which can be completed within the specified time (usually nine weeks), is within the capabilities of the student, and which relates to the student's academic focus.

The student is to be given guidance on work procedures and any necessary background reading. Time and staff personnel must be scheduled to orient the intern to the agency's personnel, facilities, and services so that time is not wasted by the intern trying to find his or her way around or whom to talk to for problems.

General compensation is encouraged, but will not be required. However, the student must be compensated for extra expenses required by the assigned job, e.g. travel to study sites, research costs, etc. Arrangements for compensation and/or expenses are to be worked out between the student, Faculty Sponsor, and agency at the earliest possible time, not later than the time the application is sent to the Internship Committee for approval. Compensation may be handled through wages, expenses, scholarships, donations, gifts, or any way that is appropriate for the circumstances of the internship, the student, and agency.

The Faculty Sponsor

The role of the faculty sponsor is to insure that the agency and work supervisor are acceptable and can perform their duties in relation to the internship. The faculty sponsor is also to insure the academic soundness of the project. The faculty sponsor is to maintain contact with the student throughout the quarter, with at least five contacts which may be initiated by either the student or faculty sponsor. The faculty sponsor, with substantial input from the work supervisor, is responsible for the final evaluation.

Should the agency fail to meet its obligations to the student, the faculty sponsor will be responsible for seeing that internship experience is not completely wasted. This may be done through alternate work or study or other means the sponsor feels are appropriate. The faculty sponsor should provide appropriate reading for the intern and should give a mid quarter grade to give the student a guide to the academic soundness of his or her work.

The CNR Office

The CNR Office will act as the coordinating body between the student and the Internship Committee. Files will be maintained on agencies, students, and faculty sponsors. A student file will include applications that are being processed, those that are in the course of being carried out, and those that have been completed, including a copy of the final report. The Office will be responsible for informing the students of the procedures and responsibilities, but will not be responsible for the intern's registration or study list filing.

CNR Major Advisor

The student's major advisor is to be consulted throughout the formation of the internship, and provide guidance to the student concerning the proposed internship. In addition, the major advisor may write a letter of support for the student's internship application and should help the student to prepare the statement describing his/her area of interest and the core courses.

Criteria for Internship Approval

Following are some of the points which the Internship Committee will evaluate:

1. The student must have the initiative, motivation, and capability to complete the task satisfactorily and to draw the necessary academic understanding from the situation. (Future Internships will be jeopardized if excessive

explanation is necessary by the agency and/or if the work is not satisfactory.)

2. The student shows tha ability to work independently and take responsibility.

3. The internship is relevant to the student's academic program.

4. Any arrangements are satisfactory which compensate the student for direct expenses and anything else agreed to.

5. The student shall not be used to replace a worker who is on strike or who is voluntarily withholding his labor.

6. The internship is not a job. It is a full time learning experience for the student and the agency.

7. The Internship Committee will guide uniformity through interaction with the agencies and faculty sponsors.

8. The Internship Committee will aid in coordination if and when problems occur.

<u>After Approval</u>

If the Internship is approved, the student is then responsible for registering and study list filing for that quarter, and making a minimum of five contacts with his or her faculty sponsor. (If distance of the agency from the campus requires that such contact be made by phone, the agency shall bear the cost of such calls.) The first contact should be 3-6 working days after internship has begun, as experience has shown that problems often arise in the first week. By the third week the faculty sponsor should be satisfied that the internship is functioning smoothly. Weekly meetings are encouraged when possible, since during the trial period the quality of internships improved with the number of contacts.

The student will make a complete written report of his or her work as an intern at the end of the quarter. The report shall include a record and substantive analysis of his or her work at the agency, a critical evaluation of the agency's role in the broad areas of natural resource conservation and environmental problems based both on readings and the student's participation at the agency, an annotated bibliography of materials read, a personal evaluation of the significance of the internship to the student's academic program, and copies of any relevant work (reports, studies, plans, etc.) completed for the agency during the internship. The grade for CNR 180 will be based on the written report, a final evaluation meeting and interim meetings. The final evaluation may take the form of a defense report. (The Faculty Sponsor should file a written evaluation of the student's report and his or her participation at the agency with the CNR Office at the completion of the quarter.)

ENVIRONMENTAL EDUCATION AND DESIGN - IDS 120

5 units Fall, Winter, Spring 1972-3

M/W 3:00 - 5:00 P.M. Class sessions at Washington School (McKinley & Bancroft) and in the field

2:00 - 3:00 P.M. and 5:00 onwards - coordination and informal discussion

Plus 6 - 8 hours field work/week

Sponsored by: School of Education, Conservation of Natural Resources Program and the Department of Landscape Architecture

Coordinating Faculty:

Fall - Professor Robin Moore, Landscape Architecture 642-2421
642-4022

Winter - Professor John Hurst, Education

Spring - Open

The scope is interdisciplinary and intercommunal.... open to students from any department; we will work with children, teachers, parents and resource people from the community at large.

The orientation is experiential...a learning-by-doing approach. Students will initiate, design and implement their own group projects in one of two main focii:

Working directly with children in the classroom, the schoolyard, Oxford Tract Urban Garden and the environment at large, designing and testing specific environmental education activities, media methods, teaching techniques, etc.

or

Working "inter-communally" to design, develop and test new physical resources for play, recreation and education on the schoolyard (Washington Environmental Yard, Project WEY).

The purpose is to seek an awareness of the connectedness of things:

of art and arithmetic and architecture and artichokes; construction and destruction; life and death; poetry and potatoes; dreams and reality; butterflies and cabbages; play and learning; past and present and future; inside and outside; hard and soft; home and school; teacher and learner; man-made and natural.

to understand the connections and the substance of the things connected and

to explore ways of interpreting, expressing and communicating such knowledge and consciousness between ourselves and children, including the rearrangement of resources in space and time through conscious design.

Students will be expected to take the course Fall and Winter as a two quarter sequence. Projects in the many possible "project areas" (media, curriculum development, natural environment, field trips, etc., etc.) will be undertaken in small groups and require 6-8 hours field work/week including weekends for some.

Class periods will be for discussion, evaluation and sessions with resource people at Washington School and in the field. A weekend trip is planned early on. The class will be limited to 25. Pre-enrollment will be held - Tuesday, September 26, 10:00 - 4:00 P.M. in 23 Giannini

URBAN GARDEN ECOSYSTEMS - CNR - 198 4 Units

Tuesday and Thursday, 10:30 am.- 12:00, Lecture. (Room #140 Oxford Tract)

12:30 pm.- 2:30, Lab and discussion periods. (Room #140, greenhouse, or Oxfo Tract Demonstration Garden - corner Virginia and Walnut.)

For purposes of this course the urban garden is defined as including all plants, with their accompanying animal systems, deliberately maintained in urban areas - backyards, parks, parkways and others.

The course will deal simultaneously with two levels :

Development of skills in managing intensive plant and animal food producing and recreational systems suitable for urban areas.

Understanding the basic ecological concepts necessary for intelligent ecosystem management under urban constraints.

Lectures and labs will include an elementary survey of certain important urban garden ecosystem components, and ecologically sound management strategies : soil - structure and chemistry; plant - development, structure and pathology; decomposer comunities; urban wildlife population dynamics; energetics; waste management; urban pollutants and micro-climate modification; concepts of systems analysis and structure, biogeochemical cycling, limiting factors, and bioethics.

Students will receive practical information and experience in raising vegetables, complimentary ornamentals, bees, rabbits and chickens, soil preparation, plant nutrition, making compost and metho of managing animal pests and plant diseases.

There will be required readings as well as an individual project expected of each student.

A faculty-student committee guides the class. Among the participants will be Dr. D.E. Williams, Dr. J. Vlamis, Soils and Plant Nutrition, Dr. R.D. Raabe, Plant Pathology, Dr. Arnold Schultz, Forestry, Dr. T. Lewis, Electrical Engineering, William Olkowski, Div. of Biological Control, Helga Olkowski, Environmental Sciences, Antioch

April 3, 1972

A full study of the solid waste problem and the political maneuvering entailed in legislative change has resulted from an IDS 10C (Spring '71) project attempting to prohibit the sale of non-returnable beverage containers in the City of Berkeley. A lesson in political power will be encountered in our analysis of the contribution that non-returnable containers make to the problem of municipal wastes and in our development of a comprehensive arguement, an effective bill and support by environmental groups.

We intend to work on the project with aid from Loni Hancock's office and Garrett DeBell. We are soliciting general opinion from merchants associations and environmental groups and obtaining legal advice and support from the Environmental Defense Fund. The bill will be presented to the City Council at the end of April and if passed, will serve as a demonstration model for future legislation in other areas.

We would like to establish this project as a CNR 198 class to receive five (5) units of credit each. We will submit a journal of action to count half of the grade, a paper concerning research done to count one quarter of the grade, and an oral discussion and critique at the end of the quarter to count one quarter of the grade to be evaluated on a letter grade basis.

Kathleen Gundry
Jacqueline Rich
1625 Grove Street
548-9353

This project will be supervised by Garrett DeBell and a faculty advisor.

LANDSCAPE ARCHITECTURE 191A

Community Participation in Design and Neighborhood Recreation Projects

Professor in charge: Robin C. Moore

This is a course for people who are concerned about the local outdoor living environment--especially of kids--and who want to improve its quality through direct social and physical action.

Action is based at Thousand Oaks Elementary School where outdoor areas are being redeveloped as resources for play and learning. Students and instructor will continue the design/development/evaluation process that has been under way now for eight months.

Class meetings will be for discussion of projects, strategies and the child-environment, including presentations of case studies. People, resources, "Nature Training", and other experiences will be shared with Landscape Architecture 198, Sec. 3 (also working at Thousand Oaks--see course description) in a joint session each week on or off campus.

Depending on enrollment, we may decide to take up one of the many requests for help we have received from schools all over the East Bay. Anyone contemplating the course is urged to visit 1000 Oaks School before the first class meeting.

Spring 1971
4 Units

LANDSCAPE ARCHITECTURE 197

Analysis of Environmental Problems
(Spring 1971-5 Units)

Objective: An internship course designed to give students actual experience in environmental problem-solving.

The internship course will involve students in the compilation and documentation of information relating to selected problem areas. The type of problems covered will include such areas as coastal management, subdivision development and power plant siting. The student will research and develop a methodology which will help to determine the possible consequences and impact on the natural environment of the problem under study. This will include analysis of those aspects of local governmental master plans related to landscape development and exploration of proposals relating to alternatives.

The work will be closely supervised by Dr. Robert Twiss, in conjunction with a number of task force personnel working as legislative assistants in Sacramento. As academic activists, the students will be required to establish a workable objective in the form of a research proposal under the guidance of the task force and Dr. Twiss. At the end of the quarter each student will be required to submit their project including an evaluation and recommendations they feel are warranted by their research. In addition each task force member and resource person that the student has utilized in his or her research will submit an evaluation form on the student's effort. This format will provide the close supervision and advising that the student requires. It will as well formalize the content to make the student's effort more meaningful.

This type of direct contact in actual real world problem-solving will help the students to synthesize their knowledge in an interdisciplinary fashion.

The student is expected to work nine hours per week on his or her project and also attend a one hour seminar per week to evaluate progress individually and as a group.

LANDSCAPE ARCHITECTURE 198, Sec. 3

Environmental Education for Elementary School Children

An exciting new program has been developed over the last two quarters in environmental education directed toward elementary school children. In this course, students have the opportunity both to investigate various approaches to environmental education and to work with small groups of children at Berkeley's Thousand Oaks Elementary School (K-3) in classroom, schoolground, and outdoor nature study situations. The class will work with a variety of resource people; some classes will be held on the school grounds with specialists training us to utilize the outdoor environment as an educational resource. But the initiative is left to the students to create and implement new curricula and concepts in education using a broad cultural and interdisciplinary approach. The class will have a joint meeting once a week with students in Landscape Architecture 191A to share resources and experience.

Credit will be given under:

Landscape Architecture 198, Sec. 3 -- Mr. Robin C. Moore
Plant Pathology 198 --Dr. Fields Cobb
Education 197 -- Dr. David Miller

Time commitment:

Joint session: Thursday 1:30-3:30
L.A. 198, Sec. 3: Tuesday 1:30-3:30
L.A. 191A: Tuesday 4:00-6:00
Field work (2 days) 10:30-1:00

Interviews will be held to limit class size to 15.

FORESTRY AND CONSERVATION 198

(Spring 1971--3 Units)

PURPOSE: To develop a feedback mechanism between post-graduation institutions and the Conservation of Natural Resources Experimental Field Major.

The course will involve sending 250 or more letters to government agencies, private companies and organizations, and graduate schools to inform them of the CNR major and to elicit information to determine what programs exist that CNR majors would qualify for upon graduation. Included in the letters would be a request for their specific course requirements for employment or admission to graduate school. Questionnaires will be sent out to all the students enrolled in the CNR program to determine what courses they are taking and how they hope to utilize their interdisciplinary undergraduate training. Combining the responses to these questionnaires with the responses from employers and graduate schools, we will attempt to make a series of recommendations to the University and to present and prospective CNR majors concerning the future of the major.

For example, should we find that law schools in general consider X number of units in the field of sociology an absolute necessity for entrance into their programs, this information will be available to students who are interested in the field of ecological law.

These letters will be written and mailed during the Winter Quarter, 1971, so that the information will be available to work with during the Spring Quarter. The initial responses would be followed up with additional requests for information if the first response was insufficient. All the replies will be compiled and catalogued in a single comprehensive report which could be referred to by CNR students and faculty advisors.

Dr. Don Erman, in charge.

STUDENT-INITIATED COURSES: In the past year the CNR Majors have discovered that many subjects they wish to investigate are not covered in regular University courses. To fill this need we have added three courses to our offerings:

198 courses--directed group study
197 courses--directed field study
199 courses--supervised individual study

When a consistent student demand for certain subject matter is shown through these individually arranged courses, that area is considered for "regularization" as a normal University course. One course has already resulted from this process (IDS 120) and more will be added next year.

INTERDEPARTMENT STUDIES 120 (Description by the IDS 120 students)

If we learn, we learn from each other. No one learns independently of other's knowledge and experience. Teacher and student learn and teach alike. We teach ourselves through personal interactions, interrelationships, and interdependencies with each participant of the class. Sharing is the dynamic force of this class. Learning to share individual knowledge and learning experiences with each other.

Specifically, the class explores endless approaches to TEACHING environmental studies to any age group of people you choose to interact with outside the university community. Perhaps, for example, in a grade school or high school environment. Class structure is varied according to acquired knowledge of needs through past experience and by personal desires of the students. Journals of activities each participant has experienced and class evaluations are both optional written manifestations of the class. Optional, but very beneficial to self and class development. Grades are dependent upon self analysis in conjuction with analysis of individual class participation. The universe is a total environment in which all things that inhabit the each planet coexist. Learning itself is an environment in which to place our minds. IDS 120 is this environment.

CNR INTERNSHIP (Presently operating under 197 and 199 credit as an experimental course--hopefully formalized in Fall 1972)

The Internship was designed to fill the gap between CNR 49 and CNR 149. It provides students with the opportunity to find direction in their education and to synthesize their current knowledge not through close interaction with others in the university community but primarily through interaction with an outside agency or organization. The student receives 12 to 15 units of credit for working with an agency or organization for one quarter. He is supervised on a one-to-one basis by both a professor here and an administrator at the agency.

The Internship has the following criteria: 1) the experience must be of value and interest to the student; 2) the experience must be productive to and agency involved; 3) it must also be a valuable educational experience to the student. The student is expected to perform as if he was an employee (within the limits of his knowledge and abilities).

The faculty's role is to periodically evaluate progress to help guide activities of the student and to relate his work experience to the realm of academic learning.

We have found this course to be particularly valuable in a major like CNR which lacks specific course requirements. We find that it can give the student a realistic picture of the usefulness of his education and the direction it should take.

PROFESSORS IN CHARGE OF CNR COURSES

Interdepartmental Studies 10

IDS 10A, Fall 1969	Arnold M. Schultz, Professor of Forestry and Conservation
IDS 10B, Winter 1970	Arnold M. Schultz
IDS 10C, Spring 1970	David Seckler, Acting Associate Professor of Agricultural Economics
IDS 10A, Fall 1970	Arnold M. Schultz
IDS 10B, Winter 1971	Sheldon Margen, Professor of Human Nutrition
IDS 10C, Spring 1971	Donald L. Dahlsten, Associate Professor of Entomology

Interdepartmental Studies 49

Spring 1970 (3 sections)	Wm. J. Libby, Jr., Associate Professor of Forestry and Genetics Donald L. Dahlsten George O. Poinar, Lecturer in Entomology
Fall 1970 (2 sections)	Harold Biswell, Professor of Forestry Harvey E. Doner, Assistant Professor of Soil Chemistry
Spring 1971 (5 sections)	Kenneth Babcock, Professor of Soil Chemistry Jurg Bieri, Assistant Professor of Agricultural Economics Richard Garcia, Associate Entomologist John Laing, Assistant Research Entomologist Richard Norgaard, Acting Assistant Professor of Agricultural Economics

Interdepartmental Studies 149

Fall 1970 (one section)	Paul Gersper, Assistant Professor of Pedology
Spring 1971 (4 sections)	Paul Gersper Joseph Hancock, Associate Professor of Plant Pathology John R. Parmeter, Associate Professor of Plant Pathology Lawrence Waldron, Associate Professor of Soil Physics

STUDENTS in CNR COURSES

Interdepartmental Studies 10:

IDS 10A, Fall quarter 1969 — Total enrollment: 268 students
- 38% Freshmen
- 17% Sophomores
- 25% Juniors
- 20% Seniors

Sample size: total enrollment

IDS 10B, Winter quarter, 1970 — Total enrollment: 522 students
- 27% Freshmen
- 27% Sophomores
- 23% Juniors
- 23% Seniors

Sample size: total enrollment

IDS 10C, Spring 1970 — Total enrollment: 415 students
- 25% Freshmen
- 25% Sophomores
- 25% Juniors
- 25% Seniors

Sample size: 263 students

IDS 10A, Fall quarter, 1970 — Total enrollment: 428 students
- 36% Freshmen
- 23% Sophomores
- 21% Juniors
- 20% Seniors

Sample size: total enrollment

IDS 10B, Winter quarter, 1971 — Total enrollment: 393 students

IDS 10C, Spring quarter, 1971 — Total enrollment: 392 students

Interdepartmental Studies 49

Spring quarter, 1970 (3 sections offered) — Total enrollment: 35 students

Fall quarter, 1970 (2 sections offered) — Total enrollment: 22 students

Spring quarter, 1971 (5 sections offered) — Total enrollment: 43 students

Interdepartmental Studies 149

Fall quarter, 1970 (one section offered) — Total enrollment: 11 students

Spring quarter, 1971 (4 sections offered) — Total enrollment: 38 students

SECTION C

INFORMATION ESSENTIAL FOR UNDERSTANDING THE CHARACTER OF CNR

ECOLOGY FIELD MAJOR STARTS REVOLUTION IN CONSERVATION EDUCATION

Journal of Educational Change * Volume 3, Number 3 * December 1971

A quiet, unheralded revolution in education is presently taking place in the College of Agricultural Sciences and the School of Forestry and Conservation. The revolution concerns ecology education and the successful techniques employed by Agricultural Sciences and Forestry in maintaining their joint experimental field major in the Conservation of Natural Resources (CNR).

CNR, which will celebrate the start of its third year on campus next month, began as an interdisciplinary field major in the winter quarter of 1970 for students motivated and concerned by public issues in the field of renewable natural resources.

The major, which has 200 students enrolled, was particularly meant for students "who prefer a broader approach than the professional one or one based on a specific science," stated the Joint Planning Committee which originally designed the major in late 1969.

Since it was initiated, CNR has attempted to follow those guidelines; and in doing so, has evolved a flexibility which can only be described as revolutionary for a campus of this size and scope.

Innovative Methods

In introducing students to the interdisciplinary nature of problems dealing with the environment, CNR has evolved several innovative methods which would be the envy of most departments, colleges or schools on campus. The methods include:

***A unique, workable advising system

***A plan whereby students can write grant proposals and initiate their own courses

***An interdisciplinary curriculum which opens virtually the entire campus to a student who might wish to combine courses in the humanities or social and natural sciences in order to understand the environment not only in physical and biological terms but through social, political and economic terms.

When a student enrolls in CNR, he is immediately interviewed by the program's administrative officials in order to determine his academic interests. After the interview, the student is given a list of four or five professors (in Agricultural Sciences and Forestry) whose interests hobbies and extracurricular activities closely match his own.

"Now if the student likes one of the professors on the list, he chooses him as his advisor," said Loren Cole, administrative associate for CNR. "If he doesn't like any of them, or if he feels he can't talk to any of them, we can give him four or five more names. We have had students go through 14 to 16 names before they found an advisor whom they could feel comfortable with," Cole said.

The advising system, which includes 25 professors, is, according to Cole, "one of the keys to the program" in that the advisor can guide a student through the broad range of campus courses or disciplines open to a CNR major.

"We look at things in terms of all of the system," said Cole, in explaining why CNR has taken the generalist approach to ecology education. "The classical ecologist, on the other hand, looks at a particular set of relationships within an ecosystem. But our concern," he added, "is based on the types of interrelationships which have primary affect on the total ecosystem."

Speaking of another example of CNR's flexibility, Cole pointed to the program's encouragement and use of student-initiated courses, such as IDS 120 in which students, according to Cole, teach "environmental education experimentally within the framework" of Bay Area public schools.

The prime mover behind IDS 120 was Carole Rollins, a teaching assistant in CNR, who, over a year ago, applied for a grant from the State Department of Education to develop a course which treated the physical environment as a resource for child development.

The State Department of Education was interested enough in the proposal to grant $6000 to Miss Rollins and other interested students. IDS 120 was initiated last year as an experiment, but this fall it became a part of the regular CNR curriculum.

The student-initiated aspects of the curriculum have brought surprisingly little criticism against CNR. The criticism which has been leveled against the program has come mostly from observers who feel that a generalized major such as CNR can have little value in an increasingly specialised world.

25 Graduates

Cole, however, replies to such criticism by pointing to the 25 students who have already graduated from CNR.

"Two of our graduates," he said, "are now in medical school, two are in law school, two are working for the Environmental Protection Agency. Several graduates are getting teaching credentials. One former student has gone into physical therapy. Another is now working for the State Department of Water Resources."

In spite of the program's success, Cole views the future of CNR as being unstable, mostly because of tight, University-wide budgetary considerations.

"We would like to start new courses such as a History and Philosophy of Conservation, or an Environmental Media course," Cole explained, "but we have no financial resources. Much of our teaching is already being done an a volunteer basis by the faculty.

"We would certainly welcome more input from the faculty throughout the campus," concluded Cole, "because we need a broad spectrum of participation in order to continue CNR's interdisciplinary approach."

Faculty Participants in the CNR Program During the Period 1969-72.

These participants (including some staff) were involved in the program through a number of possible avenues. They may have been part of a course as a lecturer, designer or coordinator. They may have participated in projects developed in the program as part of an official course or through student and faculty efforts to research and resolve some particular topic of interest. Involvement has been so extensive that it would be nearly impossible to recollect all of those who have participated and the manner in which they have participated. My sincere apologies if I have inadvertantly left anyone off the list.

Alexander, C. W. (Arch.)
Almy, M. (Educ.)
Ammon, P. R. (Educ.)
Andersen, Ann (CNR)
Andersen, J. N. (Anthro.)
Anderson, J. R. (Ento & Par.)
Appleyard, D. (CRP)
Arkely, R. (SPN)
Ashworth, L. J. (Pl. Path.)
Auslander, D. M. (Mech. Engr.)
Audy, J. R. (U.C. Med. Cen.)
Bailey, R. M. (Pub. Hlth.)
Bain, J. S. (Econ.)
Baker, K. R. (Pl. Path.)
Barnhart, E. N. (Rhet.)
Bascom, W. R. (LMA)
Beach, F. A. (Psych.)
Bell, A. T. (Chem. Engr.)
Bender, R. (Arch.)
Benedict, M. R. (Ag. Econ.)
Benson, S. B. (Msm. Vert. Zo)
Berry, F. A. F. (Geol. & Geo.)
Biller, R. (Pub. Pol.)
Biswell, H. H. (Frst.)
Bunnell, F. (CNR)
Blackwell, D. (Stat.)
Blum, H. L. (Pub. Hlt.)
Birch, M. (Ent.)
Boles, J. N. (Ag. Econ.)
Bonar, L. (Bot.)
Briggs, G. M. (Nutr. Sci.)
Brown, M. (CNR.)
Browne, L. E. (Ento. & Par.)
Allen, W. W. (Ento.)
Alonso, W. (CRP)
Amster, H. (Nuc. Engr.)
Andersen, J. L. (Coop. Ext.)
Anderson, J. K., (Clsc.)
Andres, Lloyd (Biol. Con.)
Archie, W., (C. R. O.)
Arnon, D. I. (Cell Phsio.)
Austin, L. F. (Zool.)
Babcock, K. L. (SPN)
Bain, B. M. (Ag. Econ.)
Baker, H. G. (Bot.)
Barlow, G. W. (Zool.)
Bartholomew, B. M. (Bot. Gdn.)
Baskin, B. (UAM)
Beatty, R. A. (Lands. Arch.)
Bellah, R. N. (Socio.)
Bendix, R. (Pol. Sci.)
Benedict, B. (Anthro.)
Benveniste, Guy (Educ.)
Berlin, B. (Anthro.)
Berry, W. B. N. (Pal.)
Birdsall, C. K. (EECS)
Bieri, J. (Ag. Econ.)
Bunnel, Pille (CNR)
Blaisdell, T. C. (Pol. Sci.)
Bohn, D. (U.C. Studio)
Bock, K.E. (Socio.)
Bollman, F. (Ag. Econ.)
Bramermann, H. J. (Math)
Brown, R. (Theme House)
Brown, S. W. (Genet.)
Buchanan, Bob (Cell Physio.)

Butterfield, K. K. (EH&S)
Calahan, D. (Pub. Hlth.)
Calhoun, A. F. (histr.)
Caltagrione, L. E. (Biol. Con.)
Cardwell, K. H., (Envir. Des.)
Casamajor, P. (Ag. Exp. Sta.)
Caspary, G. E. (Histr.)
Chang, G. (Nutr. Sci.)
Chemsak, J. A. (Ento & Par.)
Chu, V. (CNR)
Clark, D. A. (Ag. Econ.)
Coates, R. (CNR)
Cockrell, R. A. (Frst.)
Cohen, N. W. (Univ. Ext.)
Coleman, R. B. (EH&S)
Colwell, R. N. (Frst.)
Conant, M. (Bud. Ad.)
Commings, J. (CNR)
Corcos, G. M. (Mech. Engr.)
Courtney, R. (Ag. Econ.)
Craik, K. H. (Psych.)
Dahlsten, D. L. (Bio. Con.)
Davis, B. S. (Msm. Ver. Zoo)
Davis, H. E. (ITTE, Civ. Eng.)
Davis, J. B. (Grad. Pub. Pol.)
Day, B. E. (Pl. Path.)
Dean, J. (Agric.)
De Janvry, A. (Ag. Econ.)
Dempster, E. R. (Genet.)
Dhaemers, M. (Arch.)
Dickert, T. G. (Lands. Arch.)
Distefano, J. (Arch, SESM)
Doner, H. E. (SPN)
Doutt, R. L. (Biol. Cont.)
Dreyfus, S. E. (IE & OR)
Dyckman, J. W. (CRP)
Eckbo, G. (Land. Arch.)
Emerson, R. (Bot.)
Erman, D. C. (Frst.)
Ewing, B. (Bio. Cont.)
Flint, P. (CNR)
Fogel, S. (Genet.)
Freitag, J. H. (Ento.)
Friberg, C. (CNR)
Fritz, E. (Frst.)
Gallagher, S. (CNR)
Garcia, R. (Biol. Cont.)
Gelling, W. (Coop. Ext.
Ghiselin, M. T. (Zool.)
Glassey, C. R. (IE & OR)
Glickman, S. E. (Psych.)
Gold, A. H. (Pl. Path.)
Golueke, C. G. (SERL)
Gordon, H. T. (Ento.)
Budnitz, R. L. (LBL)
Buxbaum, R. M. (Law)
Calloway, D. H. (Nutr. Sci.)
Cameron, D. R. (Genet.)
Carmichael, I. (Geol. & Geop.)
Casida, J. E. (Ento.& Par.)
Castillo, E. (Native Amer.)
Cheatman, N. H. (NLWRS)
Chernin, M. (Soc. Wel.)
Churchman, C. W. (Bus. Ad.)
Coale, A. J. (DIGS)
Cobb, F. W. (Pl. Path.)
Coffey, J. (Ag. Econ.)
Cole, S. L. (CNR)
Colwell, R. K. (Zool.)
Commins, E. D. (Phycs.)
Constance, L. (Bot.)
Cooper, Marcus, C. (Lan. Arch.)
Corwin, R. (CNR)
Craig, R. (Ento.)
Cross, I. B. (Econ.)
Daly, H. V. (Ento.)
Davis, C. (Coop Ext.)
Davis, J. (Msm. Vert. Zoo.)
Davis, K. (IPUR & Socio.)
Day, P. R. (SPN)
DeBell, G. (CNR)
Dekker, C. A. (Biochem.)
DeVos, G. A. (Anthro.)
Diamond, B. L. (Crim. Law)
Dillon, J. (Clcs.)
Dolhinow, P. C. (Anthro.)
D'Onofrio, C. N. (Pub. Hlt.)
Dreyfus, H. L. (Phil.)
Duhl, L. J. (Hlth. Sci.)
Eberhard, W. (Socio.)
Ely, R. (CNR)
Epstein, E. M. (Bus. Ad.)
Ervin-Tripp, S. M. (Rhet.)
Falcon, L. A. (Ento.)
Fort, J. (Crim.)
Foley, D. L. (CRP)
Fretter, W. (Physcs.)
Furman, D. P. (Ento.)
Galloway, T. (SERL, H&SE)
Garnett, W. A. (Lands. Arch.)
Gersper, P. L. (SPN)
Glacken, C. (Geog.)
Glenny, L. A. (Educ.)
Gofman, J. W. (Med. Physcs.)
Goldman, S. (Econ.)
Goodman, R. E. (Trans. Engr.)
Gordon, R. A. (Econ.)
Grens, E. A. (Chem. Engr.)

Grah, R. F. (Frst.)
Griffin, J. R. (Msm. Ver. Zoo)
Gress, F. (Zool.)
Hass, E. B. (Pol. Sci.)
Hamai, J. (Biol. Cont.)
Hancock, J. G. (Pl. Path.)
Hall, Robert (CNR)
Hassid, S. Y. (Arch.)
Heady, H. (Frst.)
Heinrich, B. (Ento.)
Helms, J. A. (Frst.)
Hildebrand, D. C. (Pl. Path.)
Hollander, J. M. (LBL)
Holmstead, R. L. (Ento.)
Horn, W. W. (Histr. Art)
Howell, F. C. (Anthro.)
Huffacker, C. B. (Bio. Cont.)
Hurlbut, F. C. (Mech. Engr.)
Isaac, G. L. (Anthro.)
Jameson, A. G. (Histr. & Lit.)
Jarvis, L. (Econ.)
Jensen, D. (Ento.)
Johnson, K. K. (Theme House)
Jones, H. B. (Med. Phycs.)
Jukes, T. H. (Med. Phycs.)
Kaplan, D. B. (Bot.)
Kaplan, S. N. (Nuc. Engr.)
Kaufman, A. N. (Phycs.)
Kendrick, J. B. (V-P, Ag. Sci.)
Kennedy, V. D. (Bus. Ad.)
Kent, T. J. (CRP)
Kettler, P. (Bus. Ad.)
King, V. (CNR)
Knaff, D. B. (Cell Phys.)
Koue, D. E. (PI Ofc.)
Laetsch, W. M. (Bot.)
Laird, A. D. K. (Mech. Engr.)
LaPorte, T. R. (Poli. Sci.)
Lee, E. C. (Pol. Sci.)
Lee, Kai (Inst. Int. Stud.)
Lehmann, E. L. (Stat.)
Leopold, Luna (L.A., Geol.)
Lerner, A. (Econ.)
LeVeen, P. (Ag. Econ.)
Levy, F. S. (Econ.)
Libby, W. J. (Frst.)
Lichtenberg, A. J. (EECS)
Lieberman, M. (EECS)
Lindgren, F. T. (DL LBL)
Little, A. C. (Nutr. Sci.)
Lofting, E. M. (Econ. LBL)
Lorentzen, R. G. (Ag. Econ.)
Lunsford, T. F. (Hlth. Sci.)
Lyman, R. L. (Nutr. Sci.)
Grossman, L. M. (Nuc. Engr.)
Guttierrez, A. P. (Biol. Cont.)
Hafner, R. P. (PA Office)
Hammel, E. A. (Anthro.)
Hand, C. H. (Zool.)
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Hauser, F. E. (Mech. Engr.)
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Heyman, I. M. (Law)
Holland, V. L. (CNR)
Holloway, D. C. (Pub. Hlth.)
Holton, R. H. (Bus. Ad.)
Horne, A. J. (H&SE)
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Lee, R. G. (Frst.)
Leopold, A. S. (Frst.)
Lepowsky, A. (Poli. Sci.)
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Levinson, A. (CNR)
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Mackenzie, M. (Anthro.)

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McBridge, J. R. (Frst.)
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Olkowski, W. (CNR)
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Oswald, W. J. (Pub. Hlth.)
Pace, N. (Physio-Anat.)
Palm, R. I. (Geog.)
Parmeter, J. R. (Pl. Path.)
Pearson, E. A. (H&SE)
Pepper, J. (CNR)
Pinnock, D. E. (Ento.)
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Riseborough, R. (Zool.)
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Sadon, E. (Ag. Econ.)
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Makhijani, A. (EECS)
Marschak, T. A. (Bus. Ad.)
Maslach, G. J. (Provost)
McComb, C. (CNR)
May, A. D. (Trans. Engr.)
McCain, A. H. (Coop Ext.)
McEvilly, T. V. (Geol. & Geo.)
McGauhey, P. H. (SERL, H&SE)
McLaren, A. D. (SPN)
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Nelbach, L. (CNR)
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Sanderson, K. M. (Blib.)

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Siri, W. E. (DL LBL)
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Schipper, L. (Phycs.)
Schlinger, E. I. (Ento.)
Schmitz, A. (Ag. Econ.)
Schrock, V. E. (Nuc. Engr.)
Schultz, A. M. (Frst.)
Schwartz, C. L. (Phycs.)
Scriven, M. (Phil.)
Searle, J. (Phil.)
Sellers, C. G. (Histr.)
Shack, W. A. (Anthro.)
Skolnick, J. (Crim.)
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Smiege, D. (Frst.)
Smith, O. J. M. (EECS)
Smith, R. F. (Ento.)
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Simmons, M. (Phycs.)
Stewart, G. R. (Engl.)
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Storro-Patterson, R. E. (U. Ext.)
Symonds, H. E. (SSL)
Takagi, P. T. (Crim.)
Tamplin, A. (LRL)
Tebbins, B. D. (Pub. Hlth.)
Teitz, M. B. (CRP)
Tetlow, R. J. (Lands. Arch.)
Thomas, J. F. (H&SE)
Tobias, B. (CNR)
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Vance, J. E. (Geog.)
Van Der Ryn, S. H. (Arch.)
Vermazen, B. J. (Phil.)
Vlamis, J. (SPN)
Von Blum, R. C. (SESAME)
Votaw, D. (Bus. Ad.)
Wake, M. H. (Biol.)
Wallace, L. T. (Coop Ext.)
Ward, A. (Arch.)
Washburn, S. L. (Anthro.)
Weinmann, C. J. (Ento.)
Werblin, F. S. (EECS)
Werthman, C. (Socio.)
Whinnery, J. R. (EECS)
Wilcox, W. W. (Frst.)
Wilhelm, S. (Pl. Path.)
Williams, M. A. (Nutr. Sci.)
Winkelstein, W. (Pub. Hlth.)
Witherspoon, P. A. (Trans. Engr.)
Wood, D. L. (Ento.)
Zinke, P. J. (Frst.)

A PARTIAL LIST OF PARTICIPANTS IN THE CONSERVATION OF NATURAL RESOURCES CURRICULUM REPRESENTING THE DIVERSITY OF INPUT FROM BUSINESS, INDUSTRIES, AND OFF-CAMPUS ORGANIZATIONS (1969-73).

NAME AND/OR ORGANIZATION

Dr. J. Poorbaugh
Bureau of Vector Control
Calif. Dept. of Public Health

Mr. D. Rothenberg
Consumers Cooperative of America

Northern Calif. Committee for
Environmental Information

Covey Weinstein, M.D.
Centro de Salud

Free Clinic
San Francisco

Ron Riuck, D. C.
International Chiroractic Assn.

Bill Plumb
Student Health Services Advisory
Committee

Garry Russell
People's Architecture
Berkeley

Martin Schiffenbauer
Rent Control Petition
Berkeley

Joe Petulla
RIOT
Committee to Municipalize P.G.&E.
Berkeley

Student Research Facility Health
Maintenance Project

John Olmsted
Calif. Institute of Man in Nature
Jughandle Creek Natural Study Area
Mendocino, California

Canessa Gallery
San Francisco

P.G.&E., Berkeley, Calif.

East Bay Municipal Utilities District
Sewage Treatment Plant, Oakland, Ca.

Audubon Canyon Ranch
Stinson Beach, Calif.

Pt. Reyes Bird Observatory
Bolinas, Calif.

Bodega Marine Laboratory
Bodega, Calif.

Consumers Cooperative of Berkeley
Mr. Don Rothenberg
Education Director
Berkeley, Calif.

M. C. Clark
Nader's Raiders

Al Rogers
Bay Area Rapid Transit
Oakland, Calif.

National Park Service
Yosemite National Park
Yosemite, Calif.

Mike Skenfield
U. S. Forest Service
Stanislaus National Forest

Richmond Model Cities
Richmond, Calif.

U. S. Army Corps of Engineers
San Francisco Bay Model
Sausilito, Calif.

California State Legislature
Sacramento, Calif.

Eric Hoffer
Longshoreman and Philosopher

J. Yeaman
Dow Chemical Co.
Richmond, Calif.

C.N.R. PARTICIPANTS - OFF-CAMPUS GROUPS AND INDIVIDUALS

NAME AND/OR ORGANIZATION

Dr. J. Shapira, Mr. Garth Hall,
Dr. P. Sabesta, Dr. Nancy Bell,
Dr. Vern Ballow, Dr. John Arvesen,
Mr. Mike Donahoe
Ames Research Facility
N.A.S.A.
Moffett Field, Calif.

Dr. James Smith
U. S. Forest Service
Berkeley, Calif.

Park Service Personnel
Yosemite Institute
Yosemite National Park
Yosemite, Calif.

A.B.A.G. Personnel
Assoc. of Bay Area Governments
Berkeley, Calif.

John Grey, Director
Berkeley City Planning Department
Berkeley, California

Gerald Meral, Staff Scientist
Environmental Defense Fund
Berkeley, Calif.

Dr. James Steere, D.V.M.
Bolinas, Calif.

A.S.U.C. Legislative Council
A.S.U.C. Lobby
Sacramento, Calif.

Gayle Rojas, Education Director
Marin Museum of Science
San Anselmo, Calif.

John Heslop, Deputy Director
Calif. Dept. of Public Health
Berkeley, Calif.

Al Heller
Skidmore, Owings & Merrill
San Francisco, Calif.

Jack Abbott
California Tomorrow
San Francisco, Calif.

John Zierold, Lobbyist
Sierra Club
San Francisco, Calif.

Norman Lind, Director
Oakland City Planning Dept.
Oakland, Calif.

Jack Port
Contra Costa County
Water District

Hon. Jerome Waldie
Representative, U. S. Congress

Dr. Fred Tarp
Department of Biology
Contra Costa College

Convair 990 Reconnaissance Flight
Ames Research Facility
N.A.S.A.
Moffett Field, Calif.

U. S. Forest Service
Lake Tahoe, Calif.

Dr. John David and Staff
Hastings Natural Historical
Reservation
Box 80
Carmel Valley, Calif.

Society for Creative Anachronism
Berkeley, Calif.

Sea Ranch Associates
Sea Ranch, Calif.

Josh Barkin
Chief Naturalist
East Bay Regional Parks

Berkeley City Council

Standard Oil of California
Richmond, Calif.

Humble Oil Co.
San Francisco, Calif.

Del Monte Corporation
San Francisco, Calif.

C.N.R. PARTICIPANTS - OFF-CAMPUS GROUPS AND INDIVIDUALS

NAME AND/OR ORGANIZATION

Bank of America
San Francisco, Calif.

Oakland Model Cities
Oakland, Calif.

John Nejedly
California State Senator

David Bohn
A.S.U.C. Studio

Alvin Baum
Bay Conservation and
Development Commission

Ted Foin
Institute of Ecology
U. C. Davis

Perry Stout
Kearney Foundation of Soil Science

Arthur Morgan
Western Regional Laboratories

Ian McHarg
University of Pennsylvania

Rev. Gordon Clanton
Graduate Theological Seminary

Stephanie Mills
Planned Parenthood

Father Jim Conway
Newman Center

G. Stewart
Food Science and Technology
U. C. Davis

David Brink
Forest Products Laboratory

David Pesonan
Garry, Dreyfus, McTernan & Brodsky
Attorneys at Law

Don Mulford
Calif. State Assemblyman

Lewis Harris
Alvin Duskin Dress Manufacturers

William Bennett
Hastings School of Law

Venustiano Olguin
Organizer
La Huelga

Reese Erlich
Former Ramparts Editor

Paul DeFalco
Federal Water Quality Control
Administration

James Hunt
Ecology Action

John Teerink
Deputy Director
Calif. Dept. of Water Resources

Ed Price
Federal Bureau of Reclamation

Frank Stead
Author, Cry California

Richard Wilson
Dos Rios Rancher

S.P.R. Charter
Author

G. Edwards, Entomology
San Jose State College

Gustav Kohn
Chevron Chemical Co.

John Goldsmith
Environmental Epidemiology
Calif. Dept. of Public Health

Gary Beers
Engineering-Science, Inc.

Joe Brecher
Continuing Education of the Bar

C.N.R. PARTICIPANTS - OFF-CAMPUS GROUPS AND INDIVIDUALS

NAME AND/OR ORGANIZATION

Leonard Sagan
Environmental Medicine
Palo Alto Medical Clinic

Lucille Newman
U. C. Medical Center

John Hessel
Stanford University

Ken Meade
Calif. State Assemblyman

Sharon Simms
Committee for Humane Abortion

Frank Felice
University of San Francisco

John Thomas
Stanford University

Jack Shapira
Ames Research

Lucy Hupp
Columnist

Tom Brewer, M. D.
Contra Costa Medical Clinic

Fred Rohe
New Age Natural Foods

Leo Trabatori
Calif. Division of Highways

Jim Sundberg
Oakland Model Cities

Paul Cobb
Planner

Herbert Greydanus
Calif. Dept. of Water Resources

Ed Royce
Sierra Club

Ed Sullivan
U. S. Bureau of Reclamation

William Siri
L.R.L.

Peter Halin
Lucky Breweries, Inc.

Chuck White
Drossler Research

Orville Schell
Bay Area Institute

John Person
Photographer

Janet Adams
Coastal Coalition

John Cummings
President
American Leisure Lands

Bert Muhly
Environmental Sciences
U. C. Santa Cruz

Harold Gregg
Marin Conservation League

Steve Herman
Evergreen State College

Jerome Lucey
Consolidated Fibers

Greg Voelm
Ecology Action

John Dunlap
Calif. State Assemblyman

Denny Valentine
County Supervisors Association

John Zierold
Sierra Club Lobbyist

Bob Whiting
Calif. Dept. of Water Resources

C.N.R. PARTICIPANTS - OFF-CAMPUS GROUPS AND INDIVIDUALS

NAME AND/OR ORGANIZATION

M. King Hubbert
U.S.G.S.

John Wood
University of Illinois

Steve Beck
Socialist Workers Party

Barry Commoner
Washington University, St. Louis

Barry Weisberg
Author, Beyond Repair

Doug Doud
Cornell University

William Mandel
Author

John Gurley
Department of Economics
Stanford University

Frieb Jantsch
Visiting Professor
Univ. of Calif., Berkeley

William Evers
Attorney at Law

Interacting and Integrating Environments

Much of the effort to provide effective interaction and integration of knowledge, comes through the design of operable and facilitative environments. The list given below is reflective of this approach and represents a sampling of the type of settings conducive to this kind of behavior.

CNR Newsletters

Phone Chains

CNR Club and Meetings

Field Trips

Dances

Films

Discussions

Potluck Dinners

Parties

Backpacking Trips

River Raft Trips

Baseball Teams

Nature Walks

Creek and Bay Cleanups

Tree Plantings

Park Service Work

Projects with Children

Grant Writing Groups

Course Development Projects

Bag Lunches

Course Evaluation Projects

Faculty Interview Teams

CNR Senior Advisor Program

Environmental Research Projects

Liasons with Environmental Groups

Developing Living Groups

Administrative Involvement

Developing Radio Programs

Information Access Files

CNR Questionnaire

The purpose of the questionnaire is to try to establish a file of courses relevant to CNR majors.

(1) Name________________________________ Year________________

(2) What is your field of interest?

A. Biological Sciences
B. Physical Sciences
C. Social Sciences
D. Other (explain)____

(3) What career area are you directing your studies toward?

A. Government
B. Law
C. Education
D. Social Agencies
E. Recreation-Park Management
F. Forest Service
G. Environmental Planning
H. Other (explain)____

(4) Within your field emphasis, would you list those courses particularly beneficial to you that might help other CNR students. Please comment briefly on the direction of the course, the effectiveness or bias of the professor, the difficulty and the background necessary.

	Quarter	Year Taken	Course	Professor
(a)				
(b)				
(c)				

(5) Why did you take these courses? (Please state course numbers)

A. Breadth Requirement
B. Area of Interest
C. Advisor Suggested It
D. Other (explain)____

(6) Here is your chance to bitch. Name any courses you took that were not worth your time and effort, and why. Please distinguish whether the material of the course or the professor's presentation of the material turned you off.

Quarter	Year Taken	Course	Professor

(a)

(b)

(c)

(7) Why did you take the courses? (Please state course numbers)

A. Breadth Requirement
B. Area of Interest
C. Advisor Suggested It
D. Other (explain)________________________________

WE NEED YOUR BIO FEEDBACK. TURN QUESTIONNAIRES INTO THE CNR OFFICE OR INTO THE DEAN'S OFFICE WHEN YOU FILE YOUR STUDY LIST. THANK YOU FOR YOUR COOPERATION!

Sample list of CNR student area of interest.

Regional Planning
Natural History
Botany: An Ecological Approach
Land Use Planning
Plant Science
Demography
Nature Photography
Marine Biology and Conservation
Biological Sciences
Urbanization Education
The Social Environment
Effects of Development of New Technology on Environment of Man
Humanistic Psychology
The Study of Ecology - Psychology - Anthropology
Geography
Soils and Water
Social Science and Environmental Issues
Environmental Education
Environmental Planning
Soil Science and Geology
Water, Air Quality
Environmental Medicine
Regional Land Use Planning
Man in Relation to Food and Plants
Environmental Studies and Education
Organic Agriculture
Everything (but maybe not)
Past and Present Communication Forms
Marine Zoology
Environmental Impact Statements
Biological Control
Plant Community Ecology
Biochemical Mode of Action of Ecological Toxins
Ecosystems
Systems Design
Application of Population Ecology Techniques to Medical Research
Medicine
Government Policy and Decision-making
Alpine and Near-alpine Planning and Management
Economical Aspects of the Environment
Urban Ecology and Communication
Human Ecology
Solid Waste Management
Community Health Planning
Oceanography
Wild Edible Plant Uses
Wildlife Management
Systems and Ecology
Natural Sciences

RECOMMENDED COURSE LIST FOR CNR MAJORS

FALL QUARTER 1970

* Completed questionnaire on file in 163 Mulford

AGRICULTURAL ECONOMICS

*100A Economic Analysis in Agriculture (4) Hoos
*120 Agricultural Policy (5)
123 Agriculture in Economic Development (5) Thorp
130 Agricultural Marketing (4) Courtney
*175 Economics of Natural Resources (5) Seckler

ANTHROPOLOGY

1 Introduction to Physical Anthropology (5) Sarich
148 Man's Ecological Relationships (5) Anderson

ASTRONOMY

*1 Introduction to General Astronomy (4) Bowyer

BIOCHEMISTRY

*102 A Survey of the Principles of Biochemistry (4) Wilson, Nielands

BIOLOGY

*1 General Biology (5-5-5) McLaren
2 Topics in Biology (2) Laetsch
*11A Introduction to the Science of Living Organisms (4-4) Jones
*150 General Ecology (4) Baker
*153 Developmental Biology (3) Wilt

BOTANY

*10 Plant Biology (4) Collins
*110 Comparative Morphology of Seed Plants (4) Kaplan
*115 Plants and Man (3) Baker
*130 Plant Cytology (4) Southworth
144 Plant Physiology (4) Lippincott

BUSINESS ADMINISTRATION

*111 Social and Political Environment of Business (5) Sethi
*150 Organizational Behavior (5) Malm
*180 Introduction of Real Estate and Urban Land Economics (5) Schaaf

CHEMISTRY

*1A General Chemistry (4-4-4) Markowitz
8A Survey of Organic Chemistry (4.5-4.5) Calvin
Contemporary Natural Science 1

COMPUTER SCIENCE

1 Computers and Data Processing (4) Baer
2 Elementary Computer Programming (5) Lehmer
*100 Introductory Computer Programming (4) Meissner

CRIMINOLOGY

100	Introduction to Criminology (4) Korn
101A	Principles of Criminal Investigation (4) O'Neill
103A	Social Origins and Characteristics of Crime (4) Schwendinger
*108	History of Crime and Its Treatment (4) Goldfarb
115A	The Criminal Law in Action (4) Sherry
*118A	The Alcoholic and the Narcotic Addict (4) Adler
123	Groups, Crowds and Gangs (4) Schwendinger
*191I	Protest, Politics, and Crime (4) Platt

ECONOMICS

1A	Elementary Economics (5) Grossman
100A	Economic Analysis and Economic Policy (5) O'Brien, Fishlow
100B	Economic Analysis and Economic Policy (5) Wiseman
102	Capital and Economic Growth (5) Douglas
*103A	Introduction to Economic Principles, Institutions and Policies (4) Lerner
110	Economic Development (5) Jarvis
121A	Industrial Organization (5) Gaskins
130	Government Finance (5) Davisson

EDUCATION

110	Learning and the Learner (3) Ammon
*118A	Introduction to Educational Research (3) Wilson
119A	Introduction to Educational Statistics (3) Marascuilo
130	The School in America (3) Clifford
*131F	The Elementary School Curriculum-Science (3) Lowery

ENGINEERING

(Civil)

21	Plane Surveying (4) Moffitt, Anderson
*123	Soil and Foundation Engineering (4) Duncan, Houston
*145	Chemistry of Waters (3) Thomas
*146A	Water Resources Chemistry (3) Thomas
*170	Introduction to Transportation Engineering (4) Manismith
180	Concrete Construction (3)
194	Economics and Management of Engineering Systems (5)
201A	Physical Oceanology (3) Wilde
*203A	Surface Water Hydrology (3) Todd

ENTOMOLOGY

*10	Natural History of the Insects (4)
101	Insect Classification (4) Hurd
102A	Anatomy and Physiology of Insects (4) Pipa
114	Introductory Forest Entomology (4) Wood, Dahlsten
*130	Biological Control of Insect and Weed Pests (4) Van den Bosch
*150	Medical and Veterinary Helminthology (6) Weinmann

ENVIRONMENTAL DESIGN

3	Perception and Communication in the Environment (4) Prestini
*4	Man and Environment (4) Quinn
190	Environmental Structure (3) Alexander

ARCHITECTURE

101 Social and Behavioral Considerations as Architectural Design Determinants (5) Esherick

LANDSCAPE ARCHITECTURE

23 Introduction to Plant Materials (4) Beatty
121 Landscape Analysis and Problem Organization (3) Violich
*122 Landscape Planning for the Community (4) Laurie
151 Social and Psychological Factors in Open-Space Design (3) Cooper
191A Community Participation in Design and Neighborhood Recreation Projects (4)
200 Ecological Factors in Regional Planning and Design (3) Twiss
*291 Environmental Simulation (2-4) Appleyard

FORESTRY

*10 Conservation of Forest and Wildland Resources (4) Zivnuska
112 Economics of Forest Enterprises (4) McKillop
*118A-B Undergraduate Seminar in Current Issues (1-1) Staff
121 Dendrology (3) Zinke
123A Ecology of Renewable Natural Resources: Ecosystem Concepts and the Major Subsystems (5) Schultz
*125 Principles of Silviculture (5) Helms

GENETICS

100 General Genetics (5) Fristrom

GEOGRAPHY

1 Physical Geography: The Surface of the Earth (5) Oberlander
100A Principles of Cultural Geography (5) Glacken
*120 Urban Geography: Morphogenesis of the Western City (5) Vance
*130A Natural Resources and Population (5) Luten
*146 Regional Climatology (5) Giovinetto
180 Field Geography (5) Powell
187 Introduction to Quantitative Methods in Geography (5) Campbell
Geographic Thought (5) Hooson

GEOLOGY

5A The Earth (4) Gilbert, Christensen
*10 Introduction to Geology (4) Berry
101 Field Geology (3) Reynolds
*106 Mineral Deposits (4) Meyer

HISTORY

132 Topics in the History of Biological Science (5) Hodge

INTERDEPARTMENTAL STUDIES (IDS)

10A Man and His Environment--Crises and Conflicts (4) Schultz
*49 Introduction to Conservation of Natural Resources (2) Dahlsten
136 Biological Deterioration of Wood (3) Wood
149 Senior Seminar in Natural Resources, Gersper
*170 Wildlife Biology and Management (4) Leopold

MATHEMATICS

1	Calculus, Schlessinger
16A-B	Analytic Geometry and Calculus (4-4) Osher

MEDICAL PHYSICS

*10	Atomic Radiation and Life (4) Mel
101	Radiation and Tracer Biophysics (4) Nicols

NUTRITIONAL SCIENCES

*2	Introduction to Food Science (3) MacKinney
*101	Food Analysis (4) Kennedy
*140	Nutrition (5) Williams
150	Experimental Nutrition (5) Lyman

FAMILY SOCIOLOGY

137	Marriage and the Family (4) Landis
139	Sociology of Child Development (4) Landis

PALEONTOLOGY

*1	Introduction to Paleontology (5) Fry
*120	Paleobotany (4) Fry

PLANT PATHOLOGY

*120	Plant Diseases (4) Raabe

POLITICAL SCIENCE

*1	Introduction to Politics (5) Axlerod, Leiserson, McFarland
101A	Political Inquiry (5) Sperlich, Gregor, Landau
107	The American Executive (5) Rourke
*111A	Urban Government and Politics (5) V. Jones
112	Basic Problems in American Government (5) Tabb
113	American Political Theory (5-5) Schaar
121	International Organization (5) Bonham
*157A	Constitutional Law of the United States (5) Muir
*160	Social Groups and Political Power (5) Rogin
*162A	Public Opinion (4) Bellquist
181	Public Administration (5) Merkle

PSYCHOLOGY

1	General Psychology (5) Riley
160	Social Psychology (5) Crawford
181	Psychological Problems in Industry (5)

PUBLIC HEALTH

*5A	Individual and Community Health (3) Stiles
150	Environmental Health Sciences (3) Oswald
156A	Microbiology of Water and Waste Water (3) Cooper
*160A	Introduction to Probability and Statistics in Biology and Public Health (4) Chiang

RHETORIC

1A Introduction to Speech (5) Miller
10 The Logic Of Argument (5) Von Blum
*45 Public Speaking (5) Stripp
105 Debate (3) Stripp
109 Analysis of Communication Content (5) Barnhart
141A Argumentative Discourse (5) Kerr
159 Law and Social Institutions (5) Grant

SOCIAL SCIENCE

102A Urban Civilization (5) Temko

SOCIOLOGY

1 Introduction to Sociology: Selected Themes (4) Edwards, Nonet
20 Population and Society (4) Goldscheider
109 Sociology and Social Thought (5) Nonet
110 Race and Ethnic Relations (5) Blauner, Edwards
117 American Society: A Comparative Analysis (5) Stinchcombe
*124 Sociology of Education (5) Hurn
160 Urban Sociology and Ecology (5) Werthman

SOIL SCIENCE

100 Soil Characteristics (4) Day
*110 The Soil as a Medium for Plant Growth (5) Babcock

Plant Nutrition

*115 The Nutrition of Green Plants (3) Broyer
*117 The Nutrition of Green Plants -Laboratory (3) Jacobson

STATISTICS

1A Introduction to Probability (3) Scholz
2 Introduction to Statistics (5) MacQueen
20 Introduction to Probability and Statistics (4) Antoniak

ZOOLOGY

*10 Animal Biology (4) Strohman
*105 Vertebrate Embryology (6) Eakin
*140 Animal Ecology (4) Paris
155 General Protozoology (5) Balamuth
*163 Mammalology (5) Patton
166 Ichthyology (5) Barlow

Courses Developed in CNR: 1969-1972.

The following list of courses are those that were created and designed as vehicles for the diverse interests of CNR students. As students discovered that their concerns and needs were not being met in the usual manner, I would initiate actions to facilitate those needs. In the beginning I would use any departmental designation (e.g., Ent. 198) to satisfy university requirements. Eventually we developed our own series of 197, 198, and 199 courses. I taught in almost all of the courses listed below and I worked with many other faculty and students in organizing and developing all of them:

- Introduction to the CNR Major
- Man and His Environment: Crisises and Conflicts
- Senior Seminars in CNR
- Environmental Education
- Internships in CNR
- Urban Garden Ecosystems
- History and Philosophy of Conservation
- Environmental Planning Seminars
- Environmental Politics
- CNR Course Compilation
- Environmental Impact Statements
- Ecosystemology
- Wild Edible Plants
- Environmental Lifestyles
- Analysis of Environmental Problems

-Analysis of Post-Graduate Opportunities for CNR

-Management Practices in Yosemite Valley

-CNR Management

-Analysis of Alternative Lifestyles

-Community Education

-CNR Field Trips

-Grant Writing in CNR

-CNR Newsletter

-Interdisciplinary Teaching

-Environmental Education - Supplement to IDS 120

-Environmental Chemistry

-Environmental Media

-Nuclear Power Plant Siting

-Environment and the Business Community

-Environmental Economics

Informational Resources:

The CNR program has retained and cataloged information pertaining to most of the activities and efforts from the years 1969-1972. This material forms the basic informational streams of the program. Independent evaluation of CNR can be made by anyone who wishes to trace and assess these files. The most salient and relevant material is listed below. Open access to information is an integral aspect of effective communication and to an ecosystems approach.

I. Program Administration: Minutes of meetings, analysis of courses, teaching and associated documents.

   A. CNR Administrative Committee

   B. CNR Innovative Course Planning Committee

   C. CNR Advisors Coordinating Committee

   D. Budget requirements for courses, staff and program

   E. Faculty participation and comments

II. Evaluations: Questionnaires and Data

   A. Student evaluation of courses in CNR and many non-CNR courses

   B. Student and faculty evaluation of program, teaching techniques and course content

   C. Student and faculty interests and research orientations

   D. Job opportunities for CNR majors

III. Operational Information: Research projects and materials

   A. Student projects from CNR courses and research efforts (see list of titles in Part II)

   B. Comprehensive files of environmental impact criteria and assessment

   C. Internship projects

   D. Environmental education materials; including slides, teaching aids and lesson plans

IV. Environmental Library: Books, films, slides, publications, magazines and associated materials.

"An Indian is only six feet tall. If he leaves the Great Valley at daybreak - and follows the sun - he can reach the Sea by nightfall. With a steady stride and good luck.

The white man covers the distance in less than an hour. He races across the earth as swiftly as the sun moves across the sky. And without effort. A slight twist of his wrist to begin, and then steady pressure applied through his leg to the ball of his right foot. Nothing more. He sits there, enclosed in a hunk of steel, rushing through space.

You white men think you are gods. To travel from the Great Valley to the Sea in less than an hour.

But not for free. The Chrome horse demands its price.

You must lay a hard mixture of rock and sand over the brown earth. You must criss cross this land with huge, smooth paths. You must destroy the trees. You must remove the wild animals. You must make a part of the world regular, even, predictable.

What energy hurtles you through space? A series of small explosions in the center of that hunk of metal. Explosions terrify my people. They are man-made thunder. Man does not make thunder cheaply. The small explosions fill the air with poison gas. Soon you will not be able to breath without choking, soon you will not be able to open your eyes without crying, soon you will not be able to live at all.

It is not an easy journey to walk from the Great Valley to the Sea. My people would not make such a journey without good reason. We would finish the day tired and hungry. But when we travelled that distance we knew the earth we walked across. We knew the leaves of the live oak, the chatter of the squirrel, the tap tap tap of the woodpecker.

White man, what do you know?

An Anonymous Native American