



CLARK UNIVERSITY
MONADNOCK

Volumes 54 and 55
1980 and 1981

MONADNOCK

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VOLUMES 54 AND 55

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The cover illustration is from a stained glass window in the Director's office, Department of Geography, Clark University.

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Editor's message

Once again we are happy to present MONADNOCK. Much of the thanks must go to you, the Alumni, for making it possible to continue this important tradition. As we communicated to you earlier in the year, publications of all kinds are beset with increasing costs and MONADNOCK is no exception. Your response was immediate and warm. We are encouraged both by your support and the fact that MONADNOCK will end the year in a state of fiscal health.

In the past year the editors of MONADNOCK have made some efforts to eliminate waste and to streamline the publication process. One important way of doing this is to cut down the number of returned copies which add considerably to the cost of operation. At the same time we wish to make sure that every Alumni who wishes to receive MONADNOCK does so. We need your help, therefore, in keeping our data base up-to-date.

This year we are happy to print the Atwood Lecture, presented April 6th, 1981 by Kenneth Boulding. Before the lecture the faculty and students were able to meet with Kenneth informally and it was an enriching, intellectual and personal experience. We include the complete text of that lecture in this edition.

As always, there are numerous people to be thanked for assistance. The Secretarial Pool of Clark, headed by Terry Reynolds, typed the text. The Cartography staff prepared the headings. We are indebted once again to Clark University Printing for their fine printing work. Kay Parella provided advice and assistance with administrative and budget details. Many graduate students helped at various stages of production, not the least being wrapping and mailing. Of course, once again, the Alumni of the Graduate School of Geography who make it possible.

Murdo Morrison

Director's message

In re-reading past directors' messages, I am struck by the note of combined optimism for the future and uncertainty of the future, which was the keynote of the 1976 Director's Message. Now in 1981 we have come a long way but the place looks surprisingly familiar.

Most importantly the Graduate School of Geography remains an exciting and dynamic place to be. No one complains about it being dull!

We do, however, have a number of ongoing concerns. How can we fit together sometimes competing goals of research, graduate and undergraduate programs in times of scarce resources? How to provide a challenging graduate education for a diverse set of graduate students? How to make each part of our undergraduate program coherent for the diverse range of majors who not only want to learn something but also be prepared for the job market?

A major new impact on the school has been the establishment of CENTED (Center for Technology, Environment and Development), a new university research center. Geographers are involved in a major training and research program in Africa, a range of studies in hazards, regional development, energy and climatic risk, all housed in CENTED. In addition, research in climatology, phenomenology, three-deckers, humanistic geography and the like, flourish outside CENTED's Alumni Gym walls.

There are some different faces in the department this year. We welcome Susan Hanson to replace Helga Leitner who, because of family reasons, was unable in the end to take up her appointment. We also welcome Chris McGee and Ron Eastman who will be here for the year, replacing in part Doug Johnson (resident in Sudan for the fall semester) and Harry Steward (at the University of Hawaii for the fall). Tim Fast is also about to take up the position of Cartography Lab manager, replacing Herb Heidt who has left

after a long and productive five years of service.

Last but most important it is my sad duty to record that Dan Amaral, a quite recent graduate of the department, friend and helper to the Main South community and temporary Assistant Professor of Geography for 1980-1981, died unexpectedly in July. We miss him.

Len Berry

In Memoriam

Daniel J. Amaral
1944-1981

THE DANIEL J. AMARAL

MEMORIAL FUND

The Department of Geography has formed a committee to set up a fund in memory of Danny Amaral. We request that you send contributions to the Daniel J. Amaral Memorial Fund, in care of Gerald Karaska, Department of Geography, Clark University, Worcester, MA 01610.

The Wallace W. Atwood lecture

Introduction

There may be nothing new under the sun and if there was the Greeks said it first or perhaps Kenneth Boulding. There is a peculiar form of benign plagiarism known as rediscovering the wheel. For those of us who muck about on the borders of disciplinary knowledge there is a special version--rediscovering Kenneth Boulding.

As a graduate student and a young professional in the early 60's helping to discover environmental perception it was a delight to stumble across The Image published five years before. Recently, while pondering with Ian Burton the global passage to the ultimate steady state world population (c. 2,500-3,000 A.D.), it was helpful to think of it as "The Great Transition," only to rediscover it on the subtitle to Boulding's The Meaning of the 20th Century published in 1964. Or perhaps it was general systems theory, peace studies, the economics of love and hate, the grants economy of the welfare state, technological evolution . . .

And to have heard this lecture is to have heard more than reflection on the dominant geographical theme (at least in the profession if not at Clark)--space. It's to observe the academician, without pomp, the stand-up comic, the youthful methodist hymnsinger, the elder Quaker contemplative, the Liverpudlian, Colorado transplant, the old colleague and friend of Howard Jefferson, and the closet geographer. In all his breadth, originality and quirkiness, Ken is intellectually and socially comfortable in our space as we are in his.

Robert W. Kates

Space as a factor of production

As we look around the world, we see innumerable objects which have clearly come into existence as a result of a process of production. These include both living organisms -- our whole bodies, animals, insects, plants, human artifacts, buildings, chairs, tables, and automobiles. Everything that we see around us has been produced. Perhaps it takes little stretch of imagination to apply the concept of production to the mountains, the rivers, the oceans, though even here there is plate tectonics, orogeny, and erosion. But there is no doubt that biological organisms and human artifacts are all a result of a process which begins in some original fertilized egg or human idea, and proceeds in a fairly regular way, through growth, maturation, and eventual aging and death or scrapping.

All processes of production have much in common. They all start off with a genetic factor that might be called "know-how," whether this is the know-how encoded in the genes and the DNA of a fertilized egg or the know-how which is encoded in the blueprints and plans for the production of human artifacts. This genetic factor represents the potential for production. In order to realize this potential, however, the genetic know-how must have access to energy for three major purposes. The first is to do work, that is, to transport selected materials to the place where production is going on, and then to transform and rearrange these materials into the structures of the product. The second use of energy is to sustain the temperatures at which these transformations of materials can go on, whether this is the blood heat of the body, or the two or three thousand degrees of the blast furnace or the pottery kiln, or the low temperatures of the freezer. The third use of energy is to transport information and instructions, which are necessary for the selection of the right materials, their transportation to the right places, and their transformation in the right ways. This may be done through coded energy

transfers itself, as, for instance, in light waves, laser beams, nerve impulses in the body, or telephones. Information may also be transmitted by the transfer of coded materials, which also require energy, such as enzymes, RNA, and so on in the body, and written messages and letters in the social system. Vocal communication involves an interesting mixture of the two. Electrical impulses go from the brain to the larynx, where they produce sound waves, which are essentially energy transfers in the material substance of the air. These are translated in the ear into electrical nerve impulses again that go into the recipient brain.

Energy is essentially a limiting factor. It initiates nothing, but if there is not enough of it, of the right kind, in the right time and place, the potential of the genetic factor cannot be realized. Appropriate materials constitute another limiting factor. If the right materials are not available, at the right time and place, all the energy in the world will not be able to transport them. In the absence of water, there is no life. Even the absence of certain trace elements may prevent biological production. Similarly with human artifacts. There must be materials in the soils, streams and mines in order for the process of production to go on.

Another important limiting factor is time. All processes of production take time. Time is involved, for instance, in the transport of materials or even the transfer of energy and information. Time is required for the processing and transformation of materials. It is very hard to speed up biological growth, and in the production of human artifacts, likewise, time is a limiting factor.

The fourth limiting factor is space. Processes of production not only take time, they require room. All products occupy space, and if there is not enough space for them, they cannot be produced. We cannot grow the world's food in a flower pot. This is the ultimate basis for the famous law of diminishing returns in economics.

It is the genetic factor of production which creates the potential for a product. The reason why there were no plastic spectacles in the year 1900 is that we did not know how to make them. Exactly the same reason can be given to

explain why there were no human beings 10 million years ago; the biological genetic structure of the earth had not developed to the point where the earth knew how to make us. It only knew how to make our pre-human ancestors. The existence of potential, however, does not mean that it will be realized. What will be realized depends on which in any particular situation is the most limiting factor. We can think of the potential as a river valley starting from a watershed. Gravitational potential will send all the water that falls on it downhill. The limiting factors of energy, materials, time, and space can be thought of as dams across the valley, and it is the first dam that the water comes to, that is, the most limiting factor, that is significant. Dams below this only have a potential significance. The metaphor has to be treated carefully, because, of course, dams overflow. A better metaphor, perhaps, would be a mountain climber who has the potential of reaching the top of a mountain but is stopped by an uncrossable fence. Here again, it is the first fence that matters. Fences beyond it are important only if the system changes and the first fence shifts.

Which of the four limiting factors is the effective limiting factor depends on the circumstances of each particular case. On the tundra, it seems likely that energy is the effective limiting factor, particularly in regard to its effect on temperature. Trees cannot grow in permafrost. In the Sahara, it is very clear that water is the limiting factor, as there is plenty of energy, producing temperatures that are suitable for growth, but nothing grows. On the Laurentian Shield, the absence of soil is an important limiting factor. In some soils, trace elements may be a limiting factor preventing the growth of certain things. Time may be an important limiting factor if the growing season is too short. This, indeed, may be the real limiting factor even in the tundra.

In biological production, these first three limiting factors tend to determine the nature of the ecosystems and the species that can survive in it--lichen on the rocks, mosses in the tundra, cactuses in the desert, palm trees in the tropics, pine trees in the colder regions, and so on. The situation is complicated by the fact that in each ecosystem the species limit each other as they move toward an ecological equilibrium.

Once the general nature of the ecosystem has been determined, however, space becomes the ultimate limiting factor, that is, just plain crowding. Any given ecosystem can only produce so much of each species per acre. This in a sense is the principle source of the Malthusian limit. If the limits of energy, materials, and time permit a given species to grow on a certain acre, it will grow and multiply until it is stopped. What stops it is crowding--the inability to find space for a new member of the species to survive. Crowding in turn depends on the capacity of other species to occupy space, but the quantity of each species in the ecological equilibrium is a function of the total space that the ecosystem has to occupy.

Strictly speaking, space should be measured by volume rather than by area. Geographers do have a slight tendency to forget this, though not, of course, good geographers. The space which an ecosystem occupies may be the volume of oceans or lakes, the volume of the soil, and the space above the soil into which plants grow and which animals and birds can occupy. There certainly seems to be a larger biomass per acre in the tropics than there is in the tundra, because of the greater height above ground that life can reach.

The evolutionary dynamics of the system is complicated by the fact that changes in any one factor may affect the limits which the others impose. The most spectacular example of this, of course, is changes in the genetic factor itself. An increase in know-how permits the ecosystem to tap new sources of energy, new materials, perhaps to economize time and to economize space. As the biogenetic know-how of the earth develops, the biomass tended to expand as various limiting factors were pushed back. Thus, the development of oxygen-using organisms increased the utilization of solar energy. The movement from water onto land increased the space available for life, as did the development of flight. Genetic mutations which enabled living organisms to utilize previously unutilized materials obviously expanded the biomass.

Furthermore, the expansion of one limiting factor may push back the limits on other limiting factors. An increase in the utilization of energy enables productive processes to go further afield in the search for materials and may push back the materials limitation. Improved materials

structures may improve the utilization of energy. The genetic mutation into tall trees expanded the volume available for the biomass, though this may be limited by the rate of solar energy conversion. Structural changes may permit better utilization of space. A very good example of this is the development of the vertebrate skeleton, which permitted a great increase in the size of the individual organism. The insect with its exoskeleton cannot get much larger than the praying mantis without collapsing under its own weight. With the vertebrate skeleton, organizations the size of the dinosaur or the blue whale are possible, and this permits greater complexity within the organization itself. An insect could never have a brain as large as a vertebrate can.

All this follows from the principle described by von Bertalanffy as "allometry." This is the principle that doubling the linear dimensions of any structure quadruples the areas and octuples the volumes. If structures are to get larger, therefore, beyond a certain point there must be structural changes which increase the area per unit of volume. We see this in the mammals through the development of lungs, bowels, brains /and so on, which are really devices for getting a lot of surface inside the structure. This is important because all interactions go on at surfaces. Everything that is important in the world is superficial! Volume and depth are significant only if surfaces can penetrate it.

These principles apply to the interpretation of social systems in human history as well as to biological evolution. It is necessary to distinguish here, however, between "biogenetic" factors, which are the genes, DNA, and all that, and what I have called "noogenetic" factors. These consist of learned structures, in biogenetically produced nervous systems, which are transmitted from one generation to the next by a learning process. This is something that begins fairly early in biological evolution. There is some doubt that it exists in worms, but it certainly seems to exist in snails, is noticeable in birds, prominent in mammals, and, of course, becomes of overwhelming importance in the human race. The biogenetic structure of humans has changed very little in the last 50,000 or 100,000 years. Adam and Eve, whatever their names were, the first true human beings, had biogenetically produced brains which had all the potential

for Beethoven and Einstein, for brains have changed hardly at all since the origins of the human race. The learned content of these brains, however, has increased almost continuously since these origins. This learning process has continually operated to push back the other limiting factors in human production.

The production of human artifacts begins, as does the production of biological organisms, with a genetic factor (in this case noogenetic) that is, some kind of know-how in the human organism. Again, this know-how has to be able to direct energy toward the transportation and transformation of materials into the improbable shapes of human artifacts, ranging from the first flint knife to the space shuttle. Because of the rise of human knowledge, the limits imposed by energy, materials, time, and space have almost continuously been pushed back, and the human niche has correspondingly increased. In the paleolithic period, it is doubtful whether the human niche on earth was more than about 10 million. In the mesolithic, indeed, it almost certainly shrank, oddly enough because the earth warmed up. The increase in energy actually made the space limitation more severe as the fertile, glacially produced soils disappeared.

The development of agriculture expanded the human niche to hundreds of millions. The rise in human knowledge here permitted a much more effective use of solar energy in the growth of crops and in the domestication of animals. In a sense, agriculture represented the utilization of solar energy on a much larger scale to direct biological materials into a usable human form, especially food. This represented fundamentally an economy of space. It enabled the human race to produce much more food per acre and therefore to sustain a much higher density of human population per acre over considerable parts of the world.

The rise of science and the discovery of fossil fuels, such as coal, oil, and natural gas, again enormously expanded the human niche into the billions. This, again, represented economizing space through increased yields of crops, utilization of previously unused land, and so on. The application of energy to improved transportation in a sense economized materials and enabled the great open spaces of America and the Southern Hemisphere to feed the crowded millions of the cities.

There is some legitimate worry as to whether this expansion of the human niche may only be temporary. At the moment, it rests on exhaustible resources both in the shape of fossil fuels and in the shape of easily accessible materials. Evolution always seems to have involved two processes which move in opposite directions rather like the "yin" and the "yang" of the ancient Chinese. The "yin" processes are the processes of exhaustion by which existing stocks of soils, lakes, even seas, and the atmosphere are "used up". In what might be described as "the first great pollution," the anaerobic organisms which seem to have been the first really vigorous forms of life "used up" the atmosphere which supported them, polluted it with their excitement, which was oxygen, and eventually almost all died off. Soils and lakes have been destroyed by the ecosystems that thrived on them long before the advent of the human race.

Counteracting this, however, is the "yang" process of increased knowledge, know-how, and adaptation. The increase in genetic know-how produced the oxygen-using organisms, which thrived on the pollution produced by the anaerobic organisms. "Co-evolution" has taken place constantly in which the pollution produced by one organism has opened up new niches for others, creating such things as nitrogen and carbon cycles of the biosphere.

In human history too we see the "yin" and "yang" processes operating. Ancient civilizations have decayed, partly perhaps because of deforestation, partly because of the accumulation of what might be called internal social poisons which sapped their vitality and energy. On the whole, however, the yang processes have predominated, which consist of the re-creation of potential, particularly in the form of know-how. As older resources have been used up, new resources have constantly been discovered in terms of energy, materials, and in terms of the more subtle forms of know-how of organization and social structure, with the consequent expansion of the human niche.

In this process of expansion and development, the pushing back of the space limitations has been of overwhelming importance. We see this prominently in agriculture and in food and fiber production in this increase of product per acre, we see it also in many other human artifacts. The development of the skyscraper, for instance, as a result of

the steel-frame method of construction, has many parallels to the shift from the exoskeleton of the insects to the endoskeleton of the vertebrates. A skyscraper is a vertebrate building as over against the traditional houses and castles which were supported by their walls. The development of skyscrapers undoubtedly increased the yield per acre of human activities in the city, although it may have produced certain diseconomies in the form of commuting in the use of human time. The miniaturization of computers is an interesting example of the economy of space, as is the substitution of telephones and other forms of electronic communication for human transportation.

Sometimes this works the other way. The development of an interstate highway is an example of space-using development, which has actually been very destructive of the pattern of cities and neighborhoods, though in the open country it has a certain grandeur and beauty. This is usually justified, however, on the grounds that it economizes time through permitting increased speed. The fact that we have now limited speed to 55 miles per hour, somewhat precariously, in the interest of energy conservation and the saving of human life is an interesting example of how another limiting factor can intervene in front of an old limiting factor.

The whole problem of trade-offs between space and time as limiting factors is very interesting, and as far as I know it has been very little explored. Sometimes, as we have seen above, they may be competitive. Economies in space result in diseconomies of time and vice versa. On the other hand, there may be situations in which they are complementary. Thus, increased yield of crops per acre may easily diminish the time needed to harvest them. An economy of time that permits two or three crops a year effectively also economizes space and permits a larger annual yield from a given acre. Even the automobile, which economized time, while it led to congestion in the central cities, also led to "urban sprawl," which might more kindly be called suburban spaciousness. The spaciousness of the American suburb with the broad lawns, dotted with ranch-type houses, contrasts sharply with the congestion of the medieval city with its tall houses, narrow streets, and total absence of greenery.

Another very interesting question, not much explored, is that of the demand for space, or spaciousness. This may vary greatly from individual to individual, even from culture to culture. The story of the westerner who moved further west in the 19th century because he couldn't stand a neighbor moving in 10 miles away represents the demand for spaciousness in the extreme. Poverty in the cities is frequently associated with sharp spatial limitations: small houses, crowding, many people in one room, and the inability to travel beyond a small neighborhood. Poverty in Appalachia may be spacious in regard to the overall environment, though somewhat narrow in terms of housing. Too much spaciousness in terms of a low density of population may also imply deprivation of human contact.

Private spaciousness does seem to be one of the first things we buy with increasing riches. We like bigger houses, more room to move around, and to travel. The relation of spaciousness and surroundings to income would, indeed, be a very interesting study. There are trade-offs here with the other limiting factors of energy, materials and time. Spaciousness in housing takes materials as well as energy, and there are signs now that these trade-offs are getting increasingly expensive so that we find people moving into townhouses, rehabilitating central city slum areas, and so on. Certainly if the automobile with the internal combustion engine does not find a substitute within 50 years or so, we are likely to see a great collapse of the spacious suburbs and a shrinking of the cities into greater congestion.

Even the increased yield of crops has involved increased application of non-renewable energy and materials in terms of tractors and fertilizers, and is a legitimate cause of ultimate concern. One of the problems, for instance, in the use of biomass for energy, that is, growing things to burn, is that this is competitive with food supply. Part of the great expansion of agricultural output, especially in the United States, has been the result of the substitution of tractors using fossil fuels for horses, which took land and hay. In 1880, horses were reported to have consumed about 25% of agricultural land area, which has since been largely turned into production for humans. If, of course, we go to gasohol-burning tractors, we may be able to do better than the horse as a converter of biomass

and solar energy. A gasohol powered tractor agriculture burning 10% of the crop instead of 25% might no look so bad.

The role of space, and, one should add, of time, in aesthetic production is a problem of great interest. Beauty is an arrangement of materials in space, whether this is a human face or body, a picture, a sculpture, or a building. Space as a limiting factor is extremely important in art, which consists very largely of proportions of different colors and shapes in the utilization of a limited space. Without limits, indeed, there is no art; modern artists have rather tended to forget this. Even such apparently mundane matters as clothing involve the utilization both of surfaces and of volumes under the limits imposed by the shape and patterns of the human body. In music, we are economizing time rather than space. The experience is that of dividing up the time of a symphony, shall we say, into appropriate successions of sounds of different frequency. In the ballet, the opera and the theatre, we are involved in economizing both time and space. The action takes place on a limited stage and in a limited time.

The economics of space is a very interesting and yet a surprisingly difficult problem. Space is quite clearly at certain times and places a commodity. The market for land is to a very large extent a market in simple space or volume, though not entirely, as the material properties of land in terms of soil, rock foundations, water tables, mineral compositions, oil or coal deposits, and so on are also a very important aspect. It is by no means easy to separate out the other properties of land from its spatial aspects, though in some cases this is done, as when, for instance, a piece of land is sold with the previous owner reserving the mineral rights or the water rights.

The study of space as a limiting factor of production, should throw a good deal of light on the nature of markets in land. A very important aspect of this is the immobility of land, which simply rests on the fact that space is where it is and nowhere else. Land prices or rents on Wall Street, for instance, are orders of magnitude higher than they are in the Adirondacks, mainly because land in the Adirondacks cannot fly down to Wall Street, and there seem to be enormous payoffs for human crowding and the propinquity of

people in the same trade. Building the World Trade Center in the Adirondacks would undoubtedly have been cheaper in terms of land prices, but there would have been considerable difficulty in keeping the building occupied with world traders. This situation is in marked contrast with the situation in labor markets. Wages on Wall Street may be substantially higher than they are in the Adirondacks, but certainly nothing like the degree to which land prices are higher, mainly because labor is much more mobile. A relatively small wage differential between two regions will produce migration from the low wage to the high wage region, which will bring down the high wage and increase the low wage. Land, however, cannot migrate and hence we have these very large differentials.

These differentials in land price have produced a large and somewhat inconclusive literature of criticism from Karl Marx and Henry George to the present day. There has been a constant uneasy feeling that land rents somehow represent "unearned" income and that, therefore, there is a strong case for expropriating them for the benefit of society. The practical difficulties of doing this, however, seem to be quite large, although some attempts at trying to capture rising land values for social benefit through taxation, such as have been tried in Australia and even in Pittsburgh, have not been wholly unsuccessful. The demand for the right to speculate, however, is an important political demand, which it also seems very hard to resist. This is related somewhat to the demand for gambling, which, after all, is a demand for inequality. Many people seem to prefer even a small chance of being richer than others to no chance at all.

The whole question of the role of limiting factors in economics is something which needs much more attention. On the whole economics has proceeded with a theory of production which involves only "contributive" factors, like land, labor, and capital. This is what I have sometimes called the "cookbook theory" of production: we mix land, labor, and capital and out come potatoes. Land, labor, and capital, however, I have argued, are medieval aggregates, almost as heterogeneous as earth, air, fire, and water and about as useful scientifically in the theory of production, although they do have value in price theory in terms of wages, profit, and rent. A theory of production, however, which emphasizes limiting factors rather than contributive

factors would clarify the whole relation of production to development. Development is process primarily in the genetic factor of know-how, simply because this pushes back the limiting factors. It is not a process of simple accumulation of the per capita stock of capital or durable goods.

Limiting Factor Theory also might throw a good deal of light on the problem of economic justice. There is a certain feeling that people make too much money out of the simple ownership of limiting factors, though how this idea is implemented, in terms of property institutions and political and legal structures is a very difficult question, to which up to now, at any rate, nobody seems to have found a wholly satisfactory answer either in terms of socialism or in terms of capitalism. Socialism, by trying to concentrate limiting factors in the hands of the state, introduces all sorts of grotesque inefficiencies and oppressiveness in terms of the genetic factor or the know-how. Capitalism likewise, runs into its own difficulties and its own pathologies. Perhaps one of the reasons why these problems seem to be so insoluble is precisely that we have not given sufficient attention to the limiting quality of factors and especially to the factor of space, which is certainly the ultimate limitation.

Kenneth E. Boulding

Preserving the past: some recent contributions in applied historical geography

Joni Seager
Michael Steinitz

Historical geographers have viewed with interest the surge of activity in historic preservation and "adaptive reuse" in the United States during the 1970's.² They have also, independently of this popular movement, contributed to a renewed concern for the forms of the cultural-historical landscape within the geographic discipline.³ At the same time, preservation planners have steadily expanded their concerns to include increasingly diverse aspects of the cultural landscape,⁴ encouraged by legislative mandates which call for the management of a broad range of cultural resources. These cultural resources include buildings, sites, districts, structures and objects -- what geographers would call landscape elements and associations.

Until recently, the major conceptual contributions to historic preservation have come from the fields of architectural history and prehistoric archaeology. Architectural history has provided a frame of reference which is often limited in scope and effectiveness to high-style, outstanding or early historic structures.⁵ As a result, historic preservation programs have been biased toward the biggest, the best and the obvious landmarks, and have been ill-equipped to deal with the vast majority of material forms and associations that have been broadly precipitated by past human presence. Traditional historic preservation programs have focused primarily on individual buildings with outstanding historical associations or aesthetic merit. Value judgements based on styles and associations form an inadequate basis for management, and have resulted in considerable loss of significant cultural resources.

Prehistoric archaeologists have introduced a broader

anthropological perspective into American historic preservation programs.⁶ They have provided a major impetus in a shift from an exclusive concern with the preservation of centrally symbolic landmarks to a more wide-ranging consideration of artifacts and structures that remain from the past. Yet the special concern of archaeology with the identification and protection of low-visibility or below-ground prehistoric sites has made it of limited use in the development of more comprehensive evaluation of the historic built environment.⁷

A major gap thus exists in the conceptual organization of American historic preservation. Architectural history and archaeology have not provided comprehensive frameworks for understanding cultural resources. State programs have been fragmentary in their approach to preservation planning, and have tended toward case-by-case crisis management. State planning agencies become aware of cultural resources which are threatened, and decide in what is often an *ad hoc* manner whether or not the property appears eligible for nomination to the National Register of Historic Places, which would entitle it to some degree of legal protection. An extremely important resource may be lost because the agency does not have sufficient information to evaluate it. In other cases, the agency may fight to save a resource which, if placed in a broader historical context, is not important enough to justify the effort. Decisions on specific resource significance must be made within a more systematic management context.

A recent project, funded by the United States Department of the Interior, as part of an effort to encourage states to adopt more rigorous and comprehensive planning strategies, provided an opportunity for the introduction of historical geography frameworks into state-level management programs. The result was the development of a comprehensive state plan for cultural resource management for the Massachusetts Historical Commission,¹⁰ which has subsequently served as a model for the development of similar programs in other states. The goal of the plan was to develop a single framework which would allow the Commission to make rational and consistent management decisions for all cultural resources, from Paleoindian projectile points to suburban subdivisions.

The role of the historical geographers in the Massachusetts Historical Commission project was not only to develop a synthetic, conceptual framework for state preservation planning, but also to coordinate contributions from an interdisciplinary group of consultants. These consultants represented a wide range of disciplines concerned with material culture, including some that had not been closely involved with preservation previously. The consultant group included people from the fields of prehistoric archaeology, architectural history, industrial and historical archaeology, folk-life studies, social history and planning. The assembly of such a diverse group to discuss shared concerns for preservation was a new and untested approach.

The Geographical Framework

The geographical framework provided an overview that gave coherence to the diverse cultural resources of Massachusetts. The major theme stressed human groups as agents of change in the Massachusetts landscape over the past 11,000 years. Elements in the cultural landscape are not isolated features, but are related in time and space through processes in local communities and regional systems. Human settlement in Massachusetts developed in non-random patterns, and these patterns can be explained by evaluating the operation of past culture systems in the environment.

More specifically, the historical geographical framework placed cultural resources in the context of the succession of people who have lived in the state (sequent occupation); the changing lifestyles practiced and resource exploitation techniques utilized by different groups in local environments (*genre de vie*); the changing structures of spatial organization, such as Christallerian settlement hierarchies (areal functional organization); and Sauerian patterns of innovation and diffusion. While the use of these concepts may seem self-evident to geographers, they were new to the Commission and to many of the consultants.

Some Issues in Cultural Resource Management

A major component of the project was a series of discussions and debates between the Commission, the geographers and the consultants. Much of the discussion focused on the

problems associated with traditional preservation programs, as well as issues involved in creating new programs.

The absence of explicit conceptual frameworks in preservation programs has allowed biases, myths and idiosyncratic interests to dominate the decision-making process. Traditional preservation efforts have favored particular areas of the state, specific periods of history, unique and high-style types, and individual properties. The aim of the project was to emphasize a more consistent and balanced view of history, and to introduce consideration of broader historical context in management programs. The resulting framework was spatially and temporally comprehensive, recognized representative as well as outstanding resources, and considered the ways in which individual features fit together in larger landscape associations.

Spatial and Locational Biases

An examination of the distribution of properties listed on the National Register of Historic Places in the state in 1978 reveals a major locational bias in preservation (see figure 1). The clustering of properties in the eastern part of the state is striking. The distribution is concentrated in the coastal areas, especially in the Boston to Salem region, and in Middlesex and Essex Counties (with clusters at Lexington and Concord).

Many places in the eastern part of the state have national historic prominence. Associations with early European settlement, the Revolutionary War, maritime and commercial prosperity, and the "Golden Age" of New England culture have all drawn attention to the east. This bias has been supported by the concentration of research in the area and by the presence of strong preservation constituencies, such as the Society for the Preservation of New England Antiquities. The mythology of Massachusetts history is that the eastern part of the state is representative of the state as a whole. The western part of the state has often been neglected and certain regions of Massachusetts are considered to have little, if any, historic significance. Research institutions in the western part of the state, such as Old Sturbridge Village, and some enlightened local constituencies represent important exceptions to this perspective.

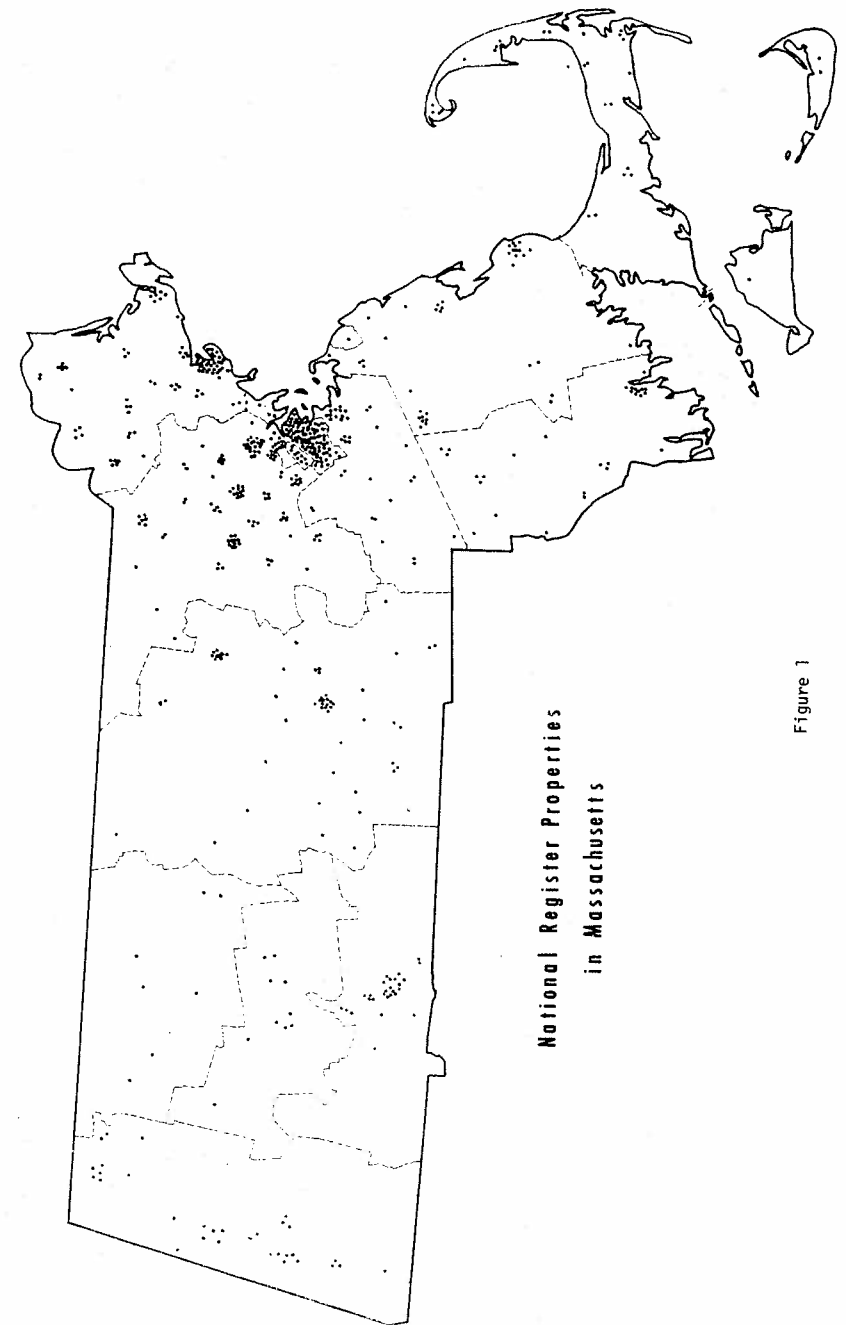


Figure 1

In an attempt to overcome this locational bias, the state was divided into regions, with each area recognized as a valid unit in and of itself. The use of regional study units provides an initial organizational framework for the identification and management of cultural resources. These divisions allow the establishment of different sets of priorities through a consideration of spatial variations in cultural resources, knowledge of these resources and developmental pressures on them.

Most people recognize some broad divisions within the state, based largely on physical differences. The Berkshire Hills, the Connecticut River Valley and the Cape Cod seashore are all readily identified. Some of these physical divisions were institutionalized by county divisions in the eighteenth and nineteenth centuries. In Massachusetts, physical and cultural macro-regions can be approximated by modifications to county lines; these became the study units (see figure 2). While these counties (or combinations of counties) were not entirely satisfactory definitions of culture regions, most of the consultants were more comfortable using established boundaries than they were drawing lines themselves.

Idealized Pasts

Historic preservation has focused not only on limited parts of the state, but on particular segments of its history. The Massachusetts landscape today is dominated by nineteenth and early twentieth century urban and industrial features. Preservation programs have glossed over this period, focusing instead on the elite residences of an idealized, pre-industrial past. In Massachusetts, "historic" usually means pre-industrial, and the cultural resources from other periods are often neglected. Preservationists have tended to deal with time sequences only in reference to changing architectural styles.

It was necessary to develop a broader and more objective periodization scheme to counter this bias. The scheme developed was based on broad periods of human occupation in the state. For prehistory, the cultural periods recognized by Northeastern archeologists (Paleoindian, Archaic and Woodland) were used. For the historic period, temporal

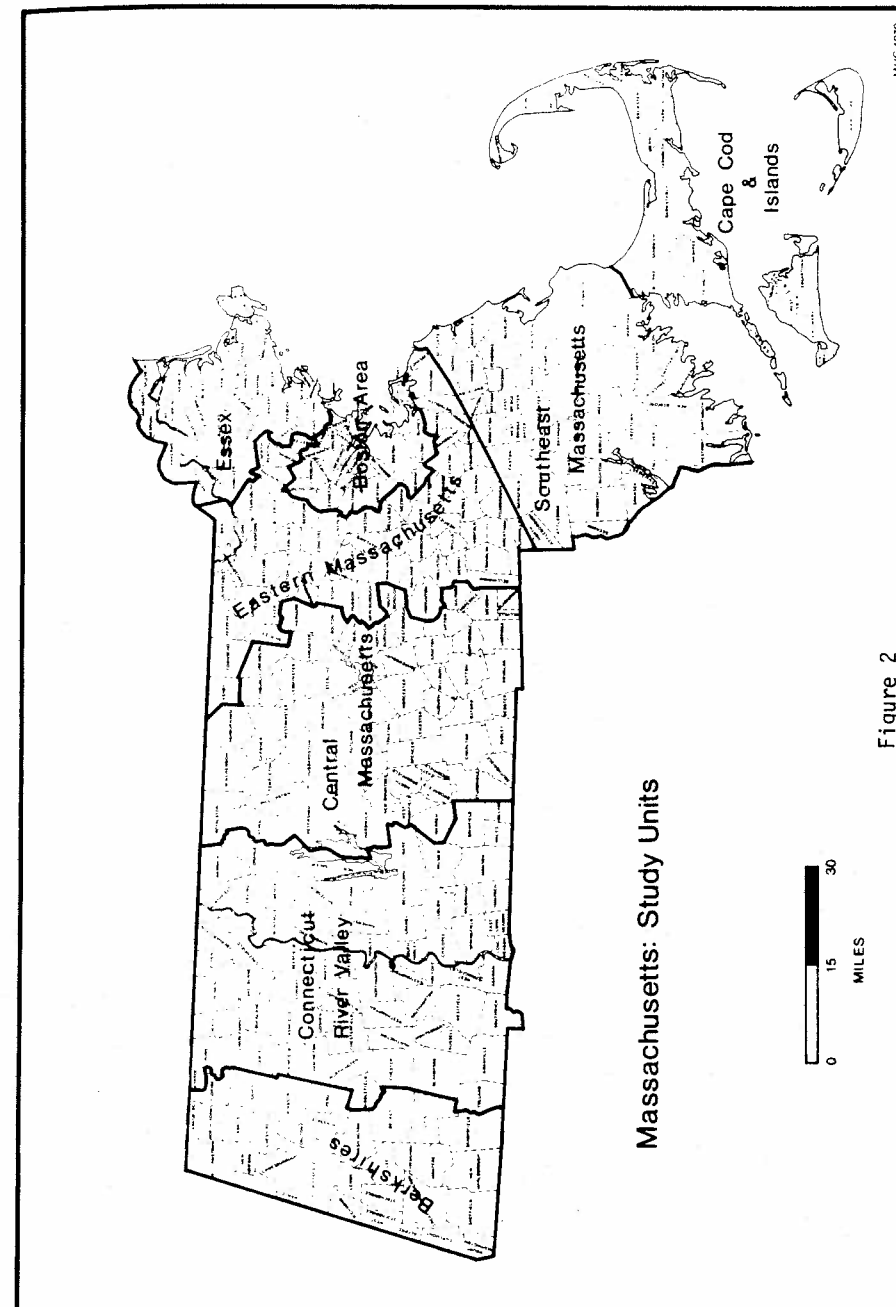


Figure 2

divisions based on initial settlement and agricultural expansion, commercial prosperity, industrial growth, and urban intensification were established. The timing and expression of this sequence of development varied regionally. This periodization scheme frames the major developmental phases in the history of the state. Each phase is characterized by distinctive cultural systems and associated forms on the landscape.

Unique vs. Representative

Unique or distinctive structures have always received more attention from preservationists than representative features. High-style structures have been more readily recognized than vernacular. Centrally symbolic features have had priority over more dispersed, commonplace forms.

Yet vernacular, popular and folk material artifacts and functional elements of communities and landscapes are at least as important as high-style structures. Commonplace cultural resources that presently are not recognized as significant may hold great potential for answering questions about past human behavior in Massachusetts. Representative and functional features are a reflection of the ways that most people lived in the past, and for this reason they must be integrated into cultural resource management programs. All project participants recognized the need to shift from an exclusive concern with the preservation of centrally symbolic landmarks to a more wide-ranging consideration of artifacts and structures that remain from the past, and in fact the Commission's programs have been moving in this direction. Geography's critical contribution is its ability to evaluate both high-style and vernacular forms in terms of landscape associations that typified different regions of the state in the past.

Generalized Development Model

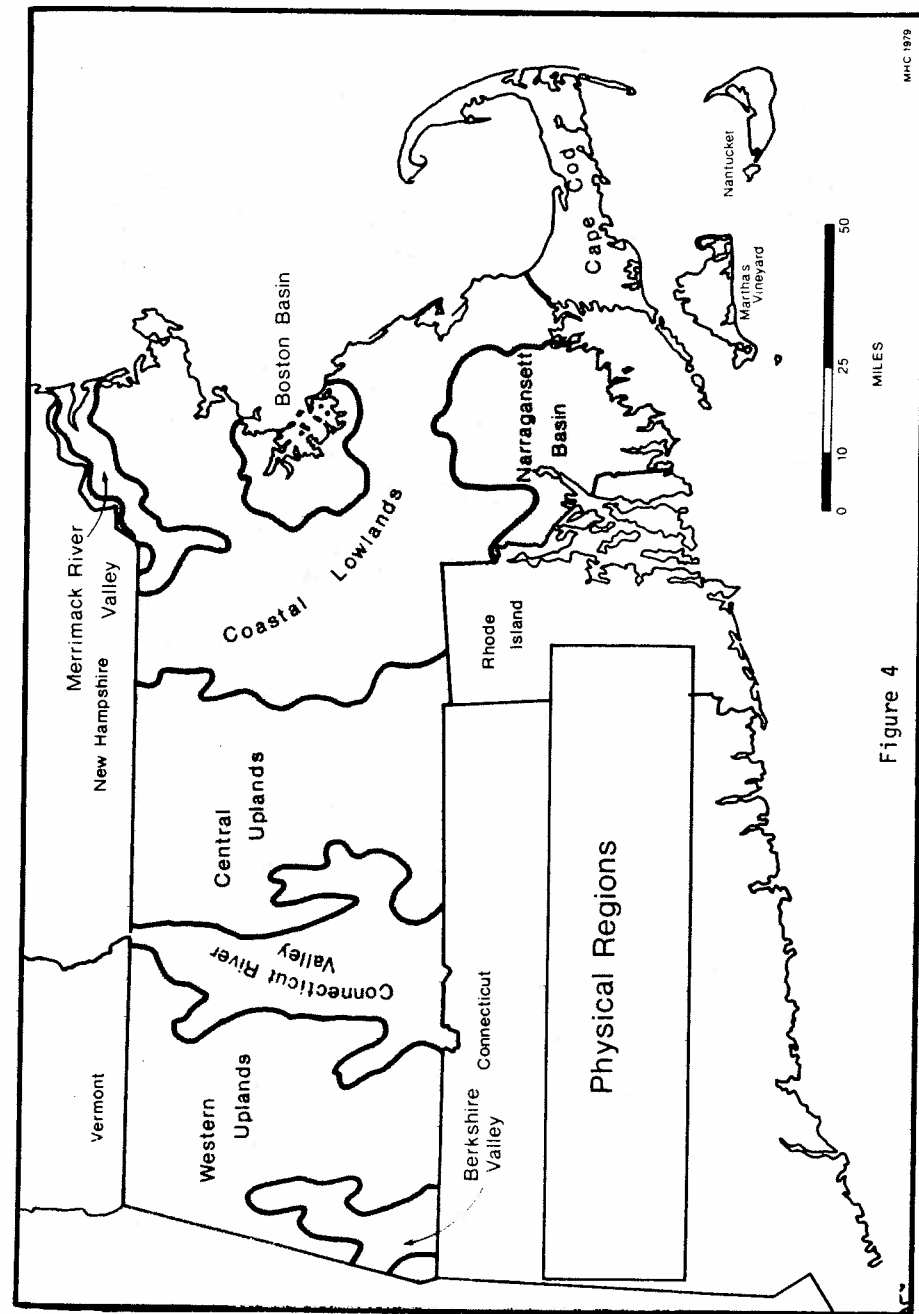
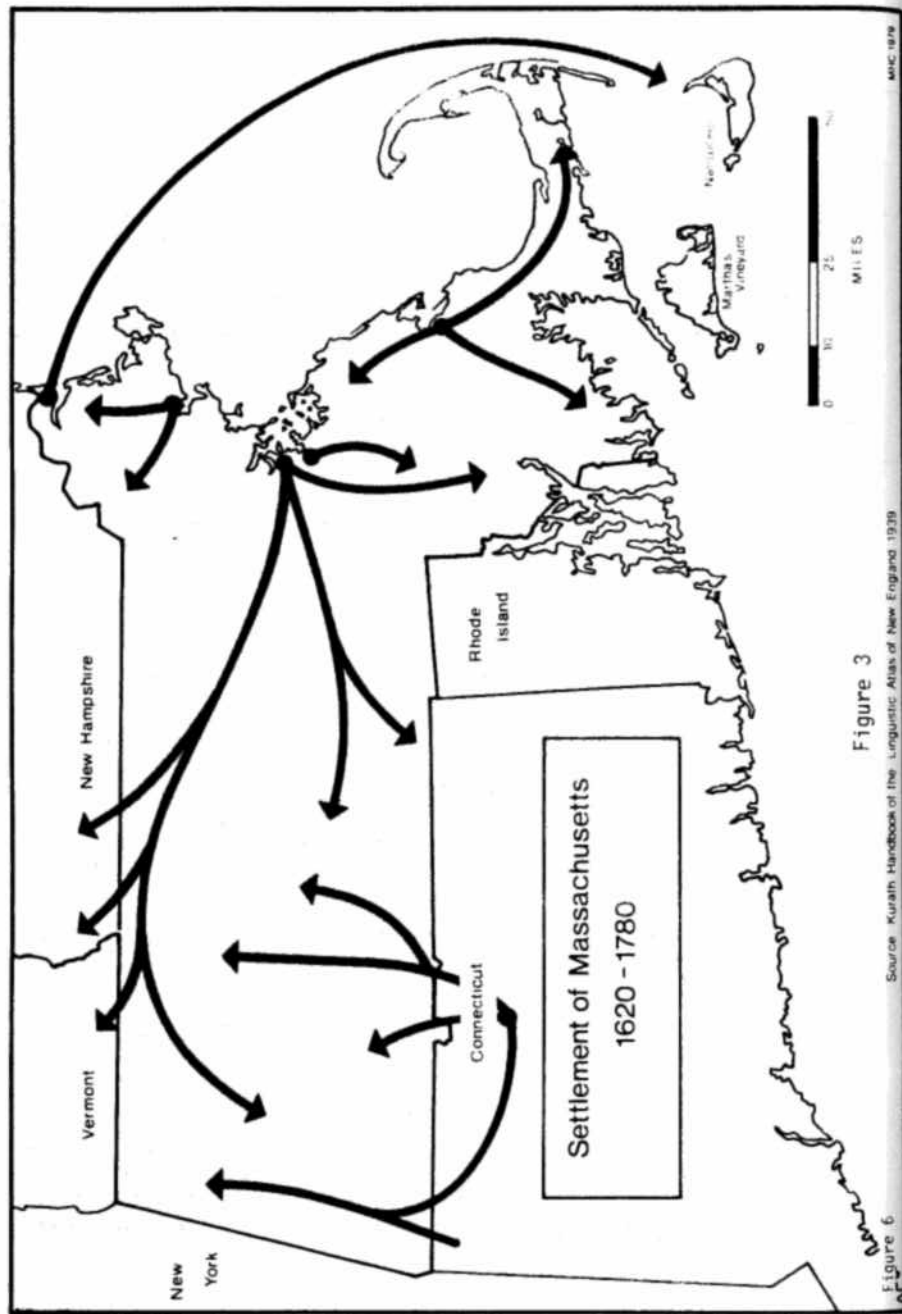
The regional divisions and periodization scheme provided a general context for the assessment of prehistoric and historic cultural features. They also led to a recognition of the significant distinction between upland and lowland areas of the state. To this was added the definition of core, fringe and corridor landscapes.¹¹

Settlement systems, population densities, economic activities and cultural features have always varied over the state, yet have characteristic patterns. There has been a persistent difference between lowland and upland areas of the state. Prehistoric population densities were higher in the coastal and lowland areas. The first European settlements were established in the lowlands, and then spread to upland areas (see figure 3). The lowlands, the major core areas of the state, have continued to be more intensively occupied than the uplands, and have been characterized by more highly developed transportation networks and greater urban concentrations. The functional relationship between the lowlands and the uplands has been a core/fringe association.

In Massachusetts, three core areas are separated by intervening uplands (see figure 4). Early in the settlement of Massachusetts, transportation links were established between these cores across the fringe areas. These have persisted to become major transportation corridors. The sequence of transportation network development shows two types of patterns: intensive in the cores, and more extensive and linear in the fringe areas.

The core/fringe/corridor relationship not only exists state-wide, but operates at smaller scales. Within a region, communities do not always grow uniformly. In both upland and lowland regions, cores, fringes and transportation corridors have developed. The relationships between these areas do not remain static. With shifts in transportation systems and economic activities, new centers emerge while others decline. The result of this differential growth is a complex pattern of types and densities of cultural resources existing within a single region at any point in time.

Each successive period of development and change in regional networks has destroyed and altered, or bypassed and preserved the cultural resources of preceding periods. In urban areas, continuous intensive development has often resulted in the destruction of most of the material remains of the past. In contrast, regions and communities which have been bypassed by successive development represent "frozen time" situations, where dominant landscapes date



from particular periods and have been minimally affected by subsequent growth. These landscapes represent associations of features that may be preserved intact.

In summary, the core/fringe/corridor concept allows a systematic delineation of regional landscape development at both local and regional levels. It provides a valuable conceptual framework for the organization and evaluation of what otherwise has been regarded as a disparate collection of discrete, individual elements of the cultural landscape. As a preservation management tool, it provides a method for "forecasting" survivals, by establishing a research strategy for surveys designed to identify expected concentrations of types of cultural resources. This systematic and comprehensive approach is an important shift away from crisis management.

While the identification of core, fringe and corridor landscapes has been framed with particular reference to Massachusetts, the concept has wider applicability in aiding other states in developing preservation programs.

Conclusion

Preservation planning cannot be based on evaluations of outstanding historical events or architectural styles. Traditional historic preservation programs have typically dealt with discrete artifacts and there has been little regard for the larger background of local and regional patterns from which individual features emerged. The geographical framework provides a time-space context for the assessment of cultural resources that explicitly includes consideration of larger, systematically related associations and features.

One result of the development of a comprehensive state plan for cultural resource management in Massachusetts has been the initiation of an interdisciplinary, reconnaissance-level survey project. The purpose of this project has been to set prehistoric and historic cultural resources in a regional context within each study unit, and to establish some basic generalizations on expected types and concentrations of cultural resources.¹² This survey has also produced a file of detailed, historical geographi-

cal landscape overviews of local communities, as well as a set of detailed maps indicating the sequence of occupancy areas within each locality. Together, these provide an easily accessible, comprehensive overview, invaluable for management purposes. As of this writing, reports have been completed for Eastern Massachusetts¹³, and analysis is proceeding on the Boston and Southeastern Massachusetts study units.

The Massachusetts plan has also served as a prototype in federal efforts to encourage the states to initiate comprehensive preservation planning.¹⁴ Unfortunately, the recent dissolution of the Heritage Conservation and Recreation Service in the Department of the Interior, and the proposed elimination of federal funding for state historic preservation offices places the continued existence of these state programs in some doubt. Whether or not preservation survives as a federally mandated and funded program, advocacy of a thoughtful conservation of the cultural landscape will continue in a variety of public policy contexts. By continuing to provide more sophisticated conceptual tools for the evaluation and appreciation of the ordinary and representative features of the cultural landscape, historical geographers will make important contributions to cultural resource management decisions in the future.

Notes

¹Sections of this paper were presented in an earlier form at the Eastern Historical Geographers/Ontario Historical Geographers joint meeting, Niagara-on-the-Lake, Ontario, October 1979.

²Representative and easily accessible examples of this literature include: Larry Ford, "Urban Preservation and the geography of the city in the U.S.A." Progress in Human Geography 3(1979), pp. 211-238; John Jakle and Richard Janiskee, "Why Covered Bridges? Toward the Management of Historic Landscapes," in Pattern and Process: Research in Historical Geography, Ralph Ehrenberg (ed.), 1977; David Lowenthal, "Past Time, Present Place: Landscape and Memory," Geographical Review 65(1975), pp. 1-36; and Pierce Lewis "To revive urban downtowns, show respect for the spirit of the place," Smithsonian 6(1975), pp. 33-41. See also John Jakle, Past Landscapes: A Bibliography for Historic Preservationists Selected from the Literature of Historical Geography. Council of Planning Librarians, Exchange Bibliography #651, September 1974.

³Humanistic approaches to place and landscape are explored by the contributors to The Interpretation of Ordinary Landscapes, Donald Meinig (ed.), Oxford: 1979. A more social scientific approach is suggested by Michael Conzen in "Analytical Approaches to the Urban Landscape," in New Dimensions in Human Geography, Karl Butzer (ed.), Chicago: 1978.

⁴The trend is evident in the recent issues of Historic Preservation, the magazine of the National Trust for Historic Preservation, and also in the January 1981 issue of Landscape Architecture, devoted to cultural landscape preservation issues.

⁵For an overview of traditional historic preservation activities in Massachusetts, see the chapters on New England in Charles B. Hosmer, Presence of the Past: A History of the Preservation Movement in the U.S. before Williamsburg, 1965; and Preservation Comes of Age: from Williamsburg to

the National Trust, 1981. For an earlier period, see Abbot Cummings, "Origins of Historic Preservation in Massachusetts," Proceedings of the Massachusetts Historical Society 87(1976), pp. 3-13.

⁶Thomas King, P. Hickman and G. Berg, Anthropology in Historic Preservation, New York: 1977.

⁷For an historians' critique of the anthropological framework, see Neil J. Meredith, Is There an Historian in the House? The Curious Case of Historic Preservation. The Public Historian, Vol. 2, #2, Winter 1980: 30-38.

⁸Arthur Krim, Northwest Cambridge: Report, Survey of Architectural History in Cambridge. M.I.T. Press, Cambridge Historical Commission, 1977; and Three-Deckers of Dorchester: An Architectural Historical Survey. Boston Redevelopment Authority, 1978.

⁹John Callahan, et al., "Report of the Three-Decker Survey of Worcester." Unpublished report. Clark University/Massachusetts Historical Commission, 1981.

¹⁰Joni Seager and Michael Steinitz, Cultural Resources in Massachusetts: A Model for Management. Boston: Massachusetts Historical Commission, 1979.

¹¹For a corridor model of regional landscape development, see C.F.J. Whebell, "Corridors: A Theory of Urban Systems," Annals, Association of American Geographers 59(1969), pp. 1-26.

¹²"State Reconnaissance Survey Scope of Work," Unpublished report, Boston: Massachusetts Historical Commission, 1979.

¹³State Survey Project, "Prehistoric Survey Team Interim Report," and "Historic Team Report: Eastern Massachusetts Study Unit," Unpublished report, Boston: Massachusetts Historical Commission, 1980.

¹⁴United States Department of the Interior, Heritage Conservation and Recreation Service, Resource Protection Planning Process. Washington, September, 1980.

Ritzville, Washington under volcanic ash, May 1980: impact and response in the agricultural sector

JIM LYONS

This article presents the results of an investigation of the initial impact and response in the agricultural sector to the Mt. St. Helens ashfall. The study, part of a larger research effort sponsored by the Natural Hazard Information Center and funded by the National Science Foundation was conducted approximately one week after the May 18, 1980 eruption in and around Ritzville, Washington - a community near the center of the heavy ashfall area (See Fig. 1). The specific purpose of the study was to document the range of immediate effects and actions taken as farmers were forced to deal with the ashfall, an extreme natural event well beyond their prior experience.

Ritzville lies in the heart of the winter wheat/summer fallow area of Eastern Washington. Agriculture is the primary regional economic activity with over one million acres in Adams County devoted to farm uses. Local precipitation is insufficient to support annual cropping so dryland farming with a fallow rotation is extensively practiced. The predominant dryland crop is winter wheat of the soft white and very soft white club varieties. The extreme SW corner of the county lies within the Columbia Basin Irrigation System. Irrigation in the rest of the county is of the deep-well/sprinkler type and affects only about 2½% of the total cropland. The principal irrigated crop in the Ritzville area is alfalfa hay.

There was little if any warning of impending disaster on Sunday, May 18. Although the recent activity of Mt. St. Helens had been noticed, there was no expectation of serious impact at such a great distance from the volcano. Also, the effects of a volcanic ashfall on modern agricultural systems were largely unknown. Recent history had not provided a comparable event. Consequently, the initial surprise was

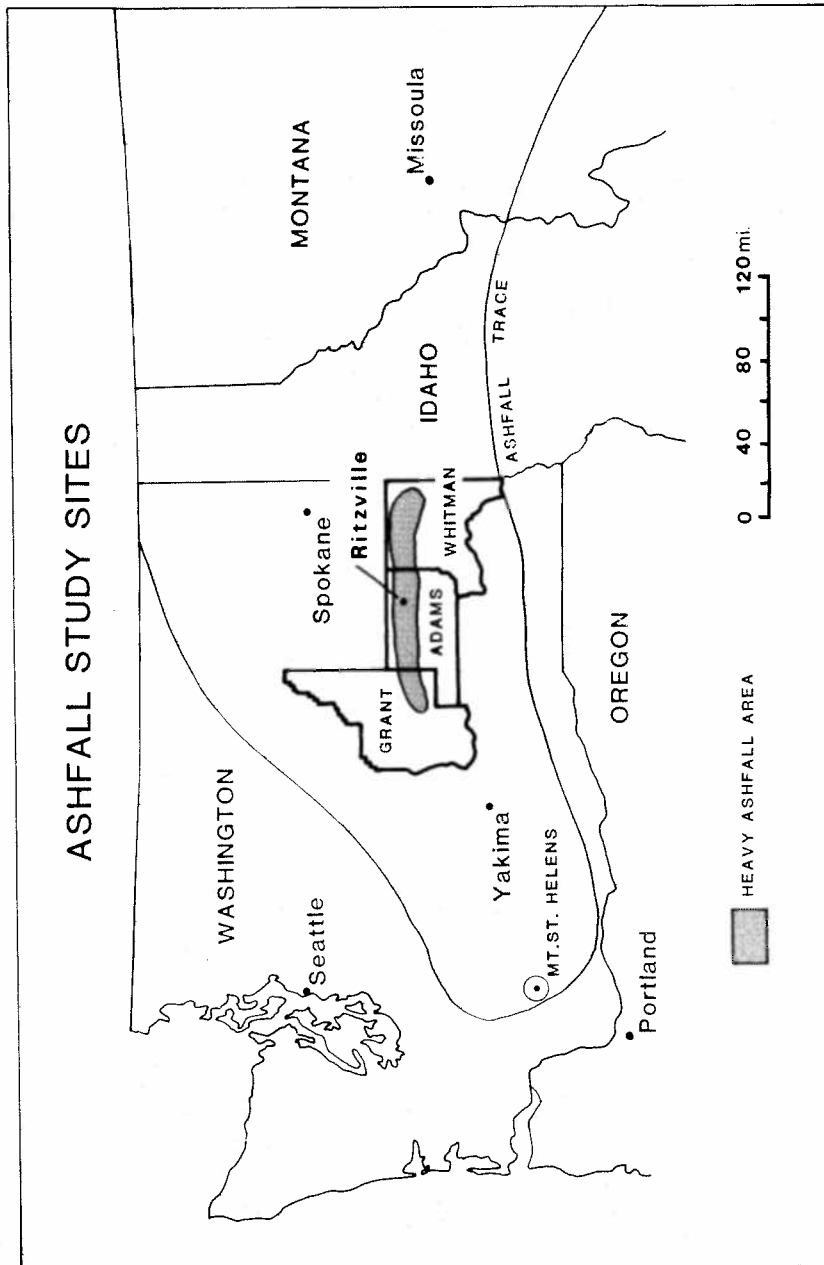


FIGURE 1

compounded by lack of information, rumor and speculation. Farmers and experts alike could not readily identify the proper course of action to take in dealing with ensuing problems. Ameliorative steps had to emerge out of a trial and error process. Given the stakes involved, such experimentation was accompanied by concern and in some cases, anxiety.

Initial estimates of crop damage were compiled by the local office of the Agricultural Stabilization and Conservation Service (see Table 1). Although the dollar loss for winter wheat was double that of all other crops, the percent loss was minimal, amounting to less than 1/20 of the acreage seeded. Most of the damage to the wheat crop was due to the plants being knocked flat under the weight of the ash. This condition, known as lodging, seemed to affect the taller club varieties such as Moro to the exclusion of other types.

Damage to the alfalfa hay crop was much more extensive. It was well along in its growth cycle on May 18 when the ash fell. The stands were stiff and lush and easily lodged. Despite attempts to wash or shake the ash off the downed hay, substantial losses due to rot and decline of nutrient value were anticipated. In areas such as Ritzville where the ashfall approached one hundred tons per acre, the losses were expected to reach 100% of the standing crop. In areas of lighter ashfall, a first cutting may still be possible but the quality and selling price of the crop will be significantly lower due to ash contamination.

Other crops, such as barley and peas, also suffered physical damage from the ashfall but the acreages involved in either case are so small as to minimize the overall impact. Chemical damage was limited to some discoloration on wheat and barley probably due to the presence of salts in low concentration in the ash deposit. This condition should prove temporary however, since over time leaching will remove these salts from the upper soil layers.

Problems with farm machinery are expected in the long term. The ash particles are extremely abrasive and likely to lead to increased wear when in contact with moving parts. Farmers and equipment dealers are especially concerned as to the possible ill effects of the ash on engines,

TABLE I

PRELIMINARY ESTIMATE OF AGRICULTURAL LOSSES DUE TO
VOLCANIC ASHFALL IN ADAMS COUNTY,
WASHINGTON AS OF 27 MAY 1980

<u>CROP</u>	<u>ACRES</u>	<u>% ACRES DAMAGED</u>	<u>% LOSS ON DAMAGED ACREAGE</u>	<u>\$ LOSS</u>
Winter Wheat	460,000	5%	100%	3,461,500
Alfalfa	11,000	15%	100%	412,500
Alfalfa		85%	50%	1,168,750
Barley	2,000	15%	100%	24,190
Peas	1,500	15%	100%	58,500
Machinery Repairs	-----	---	----	7,000,000
				+ _____
Total Losses				\$12,125,440

Source - Natural Disaster Damage Assessment Report, USDA
Adams County Emergency Board, May 27, 1980.

bearings and cutting edges. Although the extent of the impact will not be known until after the summer harvest season, preventative steps are already underway. Maintenance schedules have been stepped up on all types of equipment. Dealers are stocking up on parts in anticipation of increased replacement rates. Brisk sales of specialized highly efficient air filters and air cleaners are reported. Despite these precautions, dusty conditions and the continued presence of the ash on plant surfaces will slow down harvest operations and further increase accompanying costs.

The effect of the ashfall on irrigation systems in the Ritzville vicinity has been minimal. The water utilized in these systems is pumped directly from deep wells into sprinklers or lines. Direct ash contamination of these supplies is considered highly unlikely. The ash did settle on irrigation equipment and worked its way inside electrical panels and switch boxes. The ash has been found to contain iron and other metals which give it a high electrical conductivity when wet. Consequently, these panels shorted out after the heavy rains of May 25-26 disabling pumps and curtailing irrigation operations. Luckily, the rain also satisfied the immediate moisture requirements of standing irrigated crops. Detrimental consequences of a lengthy equipment shutdown were thus avoided.

Most of the ash formed a layer on the soil surface within a few days of the eruption. This layer will remain in place for some time unless otherwise disturbed by erosion or tillage equipment. The ash is more reflective of incoming solar radiation and has a lower permeability for water than the underlying soil. Thus it is anticipated that the continued presence of the ash layer will alter soil moisture and temperature conditions.

Soil temperatures will probably be reduced somewhat. The consequences for crop growth and germination have not yet been determined. In addition, soil moisture transfer will most likely be inhibited. The ash will essentially act as a mulch. It will retard capillary action and subsequent evaporation in dryland areas. This will substantially reduce summer soil moisture loss but may also lead to a higher incidence of plant diseases associated with moisture soil conditions. Correspondingly, infiltration rates on irrigated ground will be slowed leading to excess

runoff and ponding. In some cases, water application rates may have to be adjusted. Initial field interviews tend to confirm these observations. Dryland farmers noted that high levels of soil moisture were evident beneath untilled summer fallow about 1½ weeks after the eruption. The heavy rains mentioned previously undoubtedly contributed to this situation. Once tilled however, the soil tended to dry out at near normal rates. Irrigated operators on the other hand complained that the ash 'sealed over like concrete' leading to panning, high runoff rates and enhanced erosion. The impact of soil moisture changes on later crop yields will depend on the level and duration of these changes as well as on the success of whatever countermeasures are taken to deal with plant diseases and moisture deficiencies.

Most farmers in the Ritzville area began to take action to forestall anticipated problems within a week or so of the eruption. All operators interviewed took immediate steps to safeguard their machinery. As mentioned previously, irrigated alfalfa growers made initial attempts to salvage their first cutting. In most cases however, damage to standing crops was not considered sufficient to initiate any adjustments.

Typically, one of the first steps taken on dryland operations involved the incorporation of the ash layer into the underlying soil on fallow acreage. The kinds of decisions faced by the operators in working the ash under are probably quite illustrative of the type of trade-offs they will face over the next few months. While a failure to incorporate the ash at all would probably lead to panning and higher levels of dust etc., heavy working of Ritzville soils in late spring can promote summer desiccation and wind erosion. As a result, most farmers choose a middle course - shallow incorporation (3-4 inches) with an implement designed to leave a 'cloddy' surface. Information from appropriate federal and state agencies has so far been of limited importance in the formulation of this and other adjustment strategies. It is therefore likely that future adjustments will proceed as much as possible in accordance with accepted practices and available equipment and will not rely heavily on advice from outside experts. Federal disaster initiatives such as the ASCS Wheat and Feed Grains Payment Program or the ASCS Emergency Conservation Program (funds pending) may in the end pick up part of the over-

all adjustment cost however.

In conclusion, we find a great deal of uncertainty on the part of farmers regarding the effects of the ash on crops, soil conditions and equipment. Considerable uncertainty also exists concerning the steps which could be taken to improve the situation. Given the extensive and diverse nature of the agricultural impact, it is evident that problems in the farm sector will prove less tractable and require more complex and lengthy adjustment strategies when compared to difficulties in other sectors.

Ecological lessons from irrigated agricultural development in Kenya 1954-1981

JOHN LUNDBLAD

Introduction

As Kenya experiences dramatic population growth with limited potential for agricultural expansion in moderate and high productivity zones and scarce financial resources, the recent policy decision to invest these limited funds in the expansion of irrigated agriculture into semi-arid and arid lands seems sound and indeed advisable. The government of Kenya (GOK) has demonstrated its ability to successfully develop a dynamic agricultural sector, its record in arid and semi arid land irrigation ranges from overwhelmingly successful to very poor.

The experience gained from the highly acclaimed Mwea Irrigation Scheme, as well as from the general successes experienced in small-holder agriculture development projects, provides a strong impetus to institute irrigation projects to achieve various national development goals. The small holder rural agricultural schemes have been successful in providing labor-intensive employment discouraging rural to urban migration, integrating small holders into the market economy, and increasing export earnings by producing both export crops and import substitution crops (Berry *et al.*, 1980, *Development Plan*, 1979). Although numerous resettlement and land redistribution programs have demonstrated these benefits, only the Mwea Scheme also provides a successful experience in irrigation of arid or semi-arid zones.

It is instructive to examine both the successful Mwea Scheme and Kenya's problem plagued irrigation scheme, Perkerra. The GOK is formulating its irriga-

tion development policy based upon the Mwea Scheme and is not affording equal attention to the reasons underlying the failure of the Perkerra Scheme (Giglioli, 1973). If, as asserted by various authors, the dramatic success of Mwea is due to the unique ecological, historical, and personal circumstances surrounding the development of the project (Moris and Chambers, 1973) then the lessons from failures such as Perkerra may prove more relevant in policy formation. These projects are examined to compare the uniqueness of the conditions behind the Mwea success and the presence or absence of the corresponding conditions at Perkerra.

Role of Irrigated Agriculture in Kenya.

By any measure, the agricultural sector dominates the traditional and market economies of Kenya. This dominance is evident in examining the sources of employment and the sources of foreign trade earning. The role of irrigated agriculture has been negligible to date (Development Plan, 1979).

The largest portion of the agricultural employment sector is comprised of 2,800,000 small holders; followed by 1,100,000 non-formal agriculturalists, 400,000 pastoralists and 300,000 workers on large scale farms. In contrast 700,000 are employed in all other aspects of the "modern sector." The combined labor force for all of the irrigated agricultural schemes accounts for 0.2% of the total agricultural labor force or 8,500 individuals (Development Plan, 1979).

A correspondingly small percentage of land under cultivation is attributed to the irrigation schemes. With a total of over 3,200,000 hectares in production to serve the market economy, Kenya has less than 10,000 hectares in irrigated agriculture. The role of irrigation is further diminished by the fact that over 7,000 hectares are located at one scheme, the Mwea (Wanga 1980, Berry et al., 1980). Although clearly an economic and financial success, the Mwea scheme, and therefore, a large majority of the irrigated production is greatly dependent upon government price protection for rice (Veen, 1973).

Because of high development costs and the scarcity of development resources, the government has required repayment of portions of the initial investment and all operating costs (Sandford, 1973). The small holders farming the irrigated fields of Mwea, Ohero, West Kano and Bunyala cultivate rice, a major import substitution crop while the farmers at Hola market cotton, and export crop. The participants in the Perkerra Scheme market cash crops of onions and chilies. In 1979 the total value of these crops was K.£ 2,700,000 as contrasted with K£ 320,240,000 for the entire market agriculture sector (Economic Survey, 1980).

Table I summarizes the contribution of irrigated production in Kenya's agricultural sector.

TABLE 1
Role of Irrigated Agriculture in
Kenya's Agricultural Sector

	Employment	Hectares in Cultivation	Gross Value of Output K£
All Six Schemes	8,500	9,296	2,800,000
Mwea Scheme	5,000	5,767	1,900,000
Total Agricultural Sector	4,300,000	3,200,000	320,000,000

Although large scale irrigated agriculture has been practiced since the mid-1950s, it has clearly been a minor supplement to a dynamic agriculture-based economy. Major policy initiatives to resettle land-less native households in the former "white highlands," establish land ownership, strengthen small holder farming, as well as to strengthen all aspects of rural life, overshadowed the small contribution made by irrigated agriculture. Blessed with large expanses of high and moderate potential agricultural land, the Government of Kenya concentrated on enhancing that valuable resource prior to undertaking major irrigation development.

During this period, 1960-1980, the National Irrigation Board was created and staffed with administrators from the Mwea Scheme (Giglioli, 1973). Widely recognized as an effective management arm of the Government, the NIB has yet to undertake any project in excess of 1,200 hectares per year, although current development plans call for significant expansion of the irrigated agricultural sector (Development Plan, 1979). With survey data identifying nearly 230,000 hectares of potentially suitable irrigable land (Giglioli, 1973 and ILO, 1972), the official governmental planning goals total 45,000 hectares under irrigated cultivation by 1983 (Development Plan, 1979). This represents a 350 percent increase in hectarage, as well as a development pace far beyond any ever experienced in modern Kenya.

The changing role of irrigated agriculture from a minor supplement in an otherwise dynamic agricultural sector to the primary source of the hectarage expansion in the near term is bound to confront bureaucratic problems. According to the former director of the NIB the task represents a formidable challenge.

On the development side the picture would be far from rosy. The maximum acreage developed in one year by the board has never exceeded 3,000 acres. Even this modest performance has put nearly unbearable strain on the Board's resources. The near total lack of qualified irrigation engineers, surveyors, draughtsmen and heavy plant maintenance personnel and the tiny number coming out of the training institutions represent very severe constraints on a rapid expansion of irrigation. (Giglioli, 1973).

In addition to institutional and manpower limitations inherent in the NIB, the national goal of 45,000 hectares under irrigated cultivation by 1983 raises serious financial issues. With the exception of the Mwea Scheme, all other projects have failed to meet projected cost/benefit estimates. No project other than Mwea has generated sufficient productions to justify the commitment of scarce

development funds (Wanga, 1980). While other policy considerations may encourage irrigated agriculture as a lower cost subsidy for generating employment or stabilizing rural settlement, the image of financial success should not be automatically assigned to NIB projects.

The NIB has adopted the premise that the Mwea scheme represents a classic example for Kenya. This model had been tested on a very small scale prior to the current large-scale expansion. As with other resettlement programs, the major emphasis of the Mwea model is on adopting management techniques to traditional and tribal traditions. The singular success at Mwea has had a profound impact on the NIB guidelines.

The development of a national irrigation organization and the concepts behind it were logical offshoots of the ideas and organization worked out at Mwea.... It was the need to protect Mwea and to enshrine the successful principles evolved at Mwea that was largely responsible for the drafting of the Irrigation Act....

The system worked out at Mwea for Kikuyu settlers growing rice has proved completely effective in other areas of Kenya with five other tribes growing completely different crops. (Giglioli, 1973).

The concentration of managerial and organizational systems has created a model with "universal applicability" (Giglioli, 1973). An examination of the uniqueness of the ecological system present at Mwea and the failure of this model to solve the problems of Perkerra raises doubts about the ecological implications of large scale irrigation development from such a perspective.

The Mwea Scheme: A Near Perfect Physical Environment

The striking financial, managerial, organizational, social and economic success of the Mwea Scheme is well documented (Leavey, 1963; Chambers and Moris, 1973; I.L.O., 1972; Jusatz, 1978; Wanga, 1980). These and other evaluations and analyses of Mwea offer little insight into the ecological impact of the scheme. Those studies that do include an ecological perspective concur with the findings of Jon Moris "The Mwea Plains have constituted an extremely favorable physical environment for the development of large-scale irrigation." (1973). The examination of this physical environment becomes crucial in determining whether the Mwea model is a near-perfect, textbook location, with little applicability elsewhere in Africa let alone in Kenya, or whether it represents a set of physical characteristics common to other locations in Kenya. The physical characteristics requiring examination include water supply, water quality, meteorological conditions, topography, and soil conditions.

Water Supply

Located in a region of the world generally described as water deficient, the Mwea Plain is favored with a water supply surplus. The predominance of the volcanic uplands immediately to the west of the plain and the highlands to the north rising to Mt. Kenya is a determining factor in the distribution of rainfall in the region (Moris, 1973). Situated at the confluence of three rivers draining these highlands into the upper Tana River, the Mwea plain receives water from the three major rivers that drain Mt. Kenya. The scheme uses water from the Nyanindi and Thiba Rivers. The third major river draining the uplands, the Rupingazi, is adjacent to potential expansion areas, however it is not integrated into the Mwea scheme (Leavey, 1963; Moris, 1973). Based upon rainfall data collected since 1949, these rivers receive the heaviest rainfall in the Mt. Kenya region. Although the water supply fluctuation runs from 44 to 173 percent of average monthly flow, the design for the current scheme calls for maximum withdrawal of water during the rainy periods because of the single crop, single planting system. The withdrawal in the dry periods is minimal, totalling less than

twenty percent of wet season withdrawal, and primarily serving subsistence plots (Manig, 1973). The system as designed does not withdraw more water than the known lowest recorded flow since 1947. While some of the credit for this situation rests with the engineers who designed the project and the managers who maintain and administer the scheme, no other location in Kenya is as well endowed, without the construction of reservoirs or other water storage systems (Veen, 1973).

Water Quality

The Mwea plain is located close to the Mt. Kenya rain zone. After leaving the mountain slopes and passing through protected forest reserve, the rivers are exposed to agricultural development for only ten miles prior to the intake on the Thiba. The quality of the water is quite good, with low salinity and silt levels making it ideal for irrigated agriculture in the tropics. The low salinity is one of the reasons for the virtual absence of salinization in the scheme. Thus, one of the major managerial/ecological problems plaguing irrigation schemes in other parts of Africa, irrigating with saline water, is eliminated (Tillman, 1980). The absence of high silt levels also minimizes maintenance problems and adverse ecological impacts. High levels of suspended solids are found in the lower Tana River Basin as well as in other proposed irrigation scheme locations in Kenya (Manig, 1973).

The presence of abundant, near pure water makes the Mwea Plain a unique location for Kenya as well as for East Africa (Moris, 1973). The ecological and managerial problems avoided because of these unique circumstances are considerable. With no other similar location in Kenya, the applicability of the environmental safeguards employed must be closely examined. It is unlikely that the type of managerial efforts undertaken to minimize salinization and siltation would be adequate in other locations.

Meteorological Conditions

Lying east of the Mt. Kenya landmass, the Mwea project area benefits from both higher rainfall than western areas and runoff from the heaviest rainfall zone (Manzig, 1973).

In addition the distance from the Mt. Kenya land mass minimizes the effect of its cloud cover during the daytime (Veen, 1973). In addition, the altitude of 3,800 feet provides a milder than normal climate for equatorial zones thus mitigating the crop damage which can accompany severe temperatures for paddy rice cultivation. The combination of adequate water, high but moderating temperatures, and long periods of cloud-free sunshine makes the Mwea Plain "a most suitable environment for paddy production, especially if cropping is scheduled..." to maximize the dry periods for harvesting and natural drying (Veen, 1973).

Topography

The design and maintenance of the canal system is greatly facilitated by the topography of the Mwea Plain as well as by its relationship to the rivers serving the system. The relatively flat gradients of the plain limit site work costs and lower the risk of improper regrading which can affect the soil profile that may have originally attracted planners to the site (Moris, 1973). The relatively flat terrain is also especially well suited for the crop selected--paddy rice.

The gradual slope of the plain away from the highlands corresponds with the gradual drop in the Thiba and Nyamindi Rivers. With intake head works on both rivers the entire system is gravity fed and naturally drained by the rivers. In addition, a smaller river, the Murubara, also drains the original Tebera section of the Scheme. Maximizing upon the natural intake, the relatively flat terrain and the exceptionally well-drained rice paddy system, the Mwea Scheme has been able to avoid the serious flooding damage experienced by schemes built on flood plains lacking natural high water level drainage (Manig, 1973). This drainage system also provides an exceptionally fast method of removing surplus rainfall allowing for better crop/water management (Moris, 1973).

As with the other physical characteristics described, the terrain of the Mwea Plain represents a unique situation in East Africa. In contrast to the requirements of the Mubuku Scheme in Uganda and the Mbarali Scheme in Tanzania,

the expensive relevening of the terrain and redesign of drainage facilities to correspond to new field elevations was unnecessary, thus allowing for a less complex, less mechanized system of water management (Moris, 1973; Manig, 1973). The topography of the Plain generally allowed for low cost construction, less complex managerial practices and lessened the potential ecological dangers of flooding and/or waterlogging. Similar sites for irrigation are not plentiful in Kenya.

Soils

The soil of the Mwea Plain is unique in its fertility, porosity, and general uniformity. In an overall area characterized by reddish sandy soils, exhibiting a high degree of porosity and low fertility, unique deposits of "black cotton" soils with occasional intrusions of reddish, sandy soil veins facilitating vertical drainage are abundant. The lacustrine origins of this rich sedimentary soil explain the presence of such a rich, young and uniformly deposited soil in this otherwise heavily weathered area (Moris, 1973).

The heavy impermeable "black cotton" soils prove uncommonly appropriate for paddy rice cultivation. The poor drainage, high fertility, uniform deposits and low alkalinity and salinity render these soils ideal for low cost gravity fed surface irrigation. In more permeable soils, a system as large as the Mwea scheme would rely on mechanical means to insure uniform application because of high rates of percolation (Veen, 1973).

The level of salinity commonly found in other East African lacustrine deposits is not present at Mwea. As with other potential ecological problems, unique physical conditions have minimized the complexity of managing the Mwea System. The purity of the water, slightly more moderate temperatures, and general lack of waterlogging conditions greatly simplify the managerial tasks necessary to forestall salinization.

The Mwea Scheme possesses a near perfect set of physical conditions for irrigated agriculture. Located near the source of clean, abundant water to supplement an already

moderate level of rainfall, Mwea does not have to address issues such as competing use of river water (hydroelectric power, reservoir development, domestic supply); ecological degradation due to salinity or siltation; or inadequate supply. The unique meteorological conditions created by the presence of Mt. Kenya and the elevation of the Mwea Plain provide a reliable source of water, moderating high temperatures and a low percentage of cloudy days. In addition, the terrain and soil conditions are unique for East Africa. The natural drainage system and gravity intake system allow for lower construction and maintenance costs, less complex design and added flood and rainstorm protection. The presence of fertile, low permeable soils with intermittent veins of highly porous sandy soils provide for ideal paddy rice.

In short, the Mwea system is endowed with an extremely favorable set of physical characteristics not common to other sites in Kenya or in East Africa. It did not encounter the salinization problems anticipated in the lower Tana River basin, which has more porous soils, higher evaporation rates and a less dependable water source due to seasonal flows and competing uses (Moris, 1973; WHO, 1973). Unlike the lower Tana where siltation and salinization are recognized problems, the Mwea enjoys relatively pure water (Wanga, 1980). The Mwea does not experience water shortages as in Perkerra and Arusha Chini in Tanzania (Moris, 1973), nor waterlogging and/or flooding of productive land as in Perkerra (Moris, 1973). Simply stated, Mwea does not experience any serious ecological problems. Although a portion of this success is attributable to good management, a very significant issue involves the highly conducive nature of the site to irrigated agriculture.

In order to provide a more balanced view of irrigated agriculture in Kenya, it is worthwhile examining the other major irrigation scheme of the mid 1950s--the Perkerra scheme. Unlike Mwea, and more like other East African sites, Perkerra stands as a monument to ecological miscalculation and misunderstanding as much as to poor management.

The Perkerra Scheme: An Unfavorable Physical Environment

As with the overwhelming successes of Mwea, the failures of the Perkerra Scheme are well documented (Moris, 1973; Chambers, 1973; Jusntz, 1978; Wanga, 1980). In general the failures cited include poor survey work and design planning, failure to fully test crops and land prior to development, the irreversibility of incremental development, and the failure to fully understand the costs of construction and management (Chambers, 1973). Although these shortcomings relate primarily to engineering and management failures, the scope of the challenge far exceeds the challenge posed by the physical environment on the Mwea Plain. While general agreement exists that the technical problems associated with the physical environment at Perkerra are not insurmountable (Chambers, 1973; Wanga, 1980), the inability of the NIB to resolve these issues should raise questions about the influence that the Mwea success has had on the NIB's ability to recognize and solve complex ecological issues. Appreciation of the physical conditions at Perkerra is necessary.

Water Supply

The most serious irrigation problem, if anything more acute in 1968 than in 1954, was the erratic flow of the Perkerra River. The rapid run-off in the eroded catchment continued to send sudden floods down the river...More critical however were the periods of water shortage (Chambers, 1973).

For three months, during the drought of 1961, the entire flow of the river was diverted into the project (Chambers, 1973). This supply proved inadequate to satisfy the water needs for the original project area, which comprised less than sixty percent of the 1961 hectareage (Wanga, 1980).

The water supply problem generated a series of feasibility studies for water storage reservoirs. Although acceptable locations were identified, each proposal proved uneconomical because of the very high silt loads present in the Perkerra River (ILO, 1972). Unlike the Mwea Scheme,

Perkerra cannot guarantee its farmers adequate water supply. Water supply problems also plague the Bunyala Scheme (Wanga, 1980) and will require the construction of large water storage reservoirs for the lower Tana Projects (Report of the Nyeri Seminar, 1978; Wanga, 1980).

Water Quality

The Perkerra River carries a high silt load with exceptionally high loads during the high rainfall, flood season (Chambers, 1973). In addition to preventing the construction of water storage reservoirs to insure adequate water supply, the high silt load, combined with the low water volume requires that the heavily silted water be used for irrigation. The resulting siltation of canals throughout the scheme places an added set of administrative tasks and costs on the Scheme's managers. Serious siltation problems also plague the Hola project and have resulted in large scale development plans for irrigation of the Lower Tana Basin. The experience of the dam construction in the Kamburu-Gtaru Area of the upper Tana River has offered an ecological lesson for all dam projects in areas of high erosion in the catchment areas of major rivers (Odingo, 1979). Although some siltation has been reported in the upper Thiba Basin, to date the impact on the Mwea scheme has been minimal.

Meteorological Conditions

The Perkerra scheme is located in an area with annual average rainfall similar to the Mwea Plain, but a major distinction between the projects occurs in the surface water supplies. The Perkerra drains a smaller catchment area than the three rivers serving the Mwea. In addition the average rainfall in that catchment is significantly less than the high rainfall eastward slope of Mt. Kenya (Chambers, 1973).

Topography and Soil Conditions

The Perkerra River rises in the steep, broken terrain on the western wall of the Rift Valley. It leaves the highlands at Lake Marigat entering alluvial plains near the lake (Chambers, 1973). The irrigation scheme is built near a pre-

colonial irrigation project designed to capture flood waters within the flood plain. In 1918 a major flood changed the course of the river, making subsequent attempts at flood irrigation impossible given indigenous practices. The Njemp tribe gave up irrigated agriculture, and adapted a pastoral economy. Within two years severe overgrazing, recurring droughts and a locust invasion rendered the productivity far below subsistence (Chambers, 1973). The modern irrigation scheme required major regrading of terrain, channeling of the river and construction of new drainage systems.

The distribution of water and layout of the irrigation system also proved difficult and expensive. The ground was more irregular than expected, which increased the amount of earth-moving necessary and required construction of culverts to carry water over gulleys (Chamber, 1973).

After four years one major portion of the project was abandoned due to excessive waterlogging and this four-hundred thirty acre tract has not been in productive use since 1961. Although the soils and terrain were deemed moderately acceptable for irrigated agriculture improper site work; changing policy decisions concerning crops, design, and management strategies; and unreliable water supply/drainage systems created an ironic situation. Waterlogged basins were placed out of production due to excessive rains and poor drainage in the same scheme where well drained fields were rendered unproductive due to a water shortage (Chambers, 1973).

The site work experience at Perkerra is not uncommon in East Africa. The Mubuku Scheme in Uganda and Mbarli in Tanzania required expensive releveilling and redesign because of terrain problems. The small Teveta Scheme in Kenya also required expensive site work to overcome variations in soil porosity and salinity (Moris, 1973).

Lessons from Perkerra

The problems of siltation, unreliable water supply, and irregular terrain do not represent insurmountable ecological problems in designing irrigation projects in

arid and semi-arid zones (Tillman, 1980). Although other non-environmental problems dominate the analyses of the failures at Perkerra, the ecological issues should not be summarily dismissed. The challenges of developing the Perkerra site were far more difficult than those faced at Mwea. To concentrate on tribal differences, crop failures, unsuitable crops, or the unwillingness of nomads to accept a settled agricultural style of life, fails to acknowledge and address the fundamental ecological problems.

The failure to prepare detailed survey and site work prior to development; the immediacy of the initial development caused by the Mau Mau Emergency; and the failure to establish a pilot project to test the area and the crops all contributed to the overall poor results. While these managerial issues are serious, they do not differ significantly from constraints present in the Mwea experience (Moris, 1973). What does differ is the lack of similarity in certain ecological conditions. Whereas Mwea may provide a textbook perfect site for largescale irrigation, Perkerra provides a more typical East African site. The major lesson from the Perkerra failure is not one of managerial inability but rather one of an absence of direly needed environmental planning. In both cases rapid unplanned development was undertaken during the Emergency. In Mwea's case the highly suitable site minimized difficult ecological problems, while the Perkerra alluvial plain contained several key environmental pitfalls. Failure to adequately plan for water supply variation, the impacts of siltation and the variability of soils and terrain set the Perkerra Scheme on a path of environmental degradation from which it has not recovered. The GOK decision to write irrigation development policies based upon the successful experience totally ignores the need for sensitivity to local ecological dynamics present.

The Future of Kenya's Irrigated Agricultural Development

Even the most optimistic estimates of the potential for irrigated agriculture in Kenya acknowledge that the total hectareage in irrigated cultivation will never provide more than a small percentage of jobs, food or productive land (Berry, 1975).

The ecological diversity of the few feasible sites for irrigation, as well as the scarcity of development capital places great importance on the applicability of NIB guidelines for new irrigation projects. Overreliance on lessons learned from the Mwea experience can not generate the strong ecological perspective necessary to insure environmentally sound irrigation development. Although the mistakes made at Perkerra do not provide an exhaustive set of potential ecological problems associated with irrigated agriculture, they do raise many of the most pressing water related issues in Kenya today.

First, the water shortage situation at Perkerra serves as an early warning for future development planning. The major limitation on future irrigated development is water not land availability (Moris, 1973; Report of the Nyeri Seminar, 1978; Wanga, 1980). Competing uses such as domestic water supply for urban and rural areas (Dworkin, 1980) and hydroelectric dam construction (Odinga, 1979; Kinyanjui, 1980) further reduce the potential for irrigated agriculture in a country with few major sources of surface water.

Second, the siltation problem in the Perkerra River is quite common to major rivers of the region. Increased deforestation and overgrazing has further aggravated the situation along the Tana River (Kinyanjui, 1980; Odinga, 1979; Ongmany, 1980). Identified as the major resource for future irrigation, the Tana experiences siltation and erratic flow patterns creating a serious ecological problem for the major projects of the lower Tana. Because of the erratic flow in the dry season, water storage reservoirs are required for large scale surface irrigation similar to the Mwea system. However, siltation and high evaporation rates severely limit dam sites on the Tana (Wanga, 1980).

Third, the inability to fully control the flow, use, and drainage of water within the system at Perkerra has been repeated in numerous other areas. Problems such as waterlogging, salinization, alkalinization and flooding are recurring ecological problems in irrigation systems the world over (Tillman, 1980). The developments along the lower Tana are already experiencing salinization and

flooding problems (Wanga, 1980).

In East Africa, with relatively few locations of surplus water, uniform soils, and easy drainage irrigation, construction costs tend to be high and managerial challenges substantial. The successes gained in the Mwea Plain Scheme could serve as a textbook example of this type of development. However, the Perkerra Scheme, with all of its failures, provides a more representative example of the ecological conditions present in Kenya and East Africa.

The success of the current policy of Kenya's development plan calling for large scale irrigation projects cannot be guaranteed without the adherence to the proposed pilot project research station and staged development proposals. However, even this cautious approach will be destined to failure without sound ecological planning which is sensitive to the dynamics of each site.

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Action research in practice

Jane Hayes

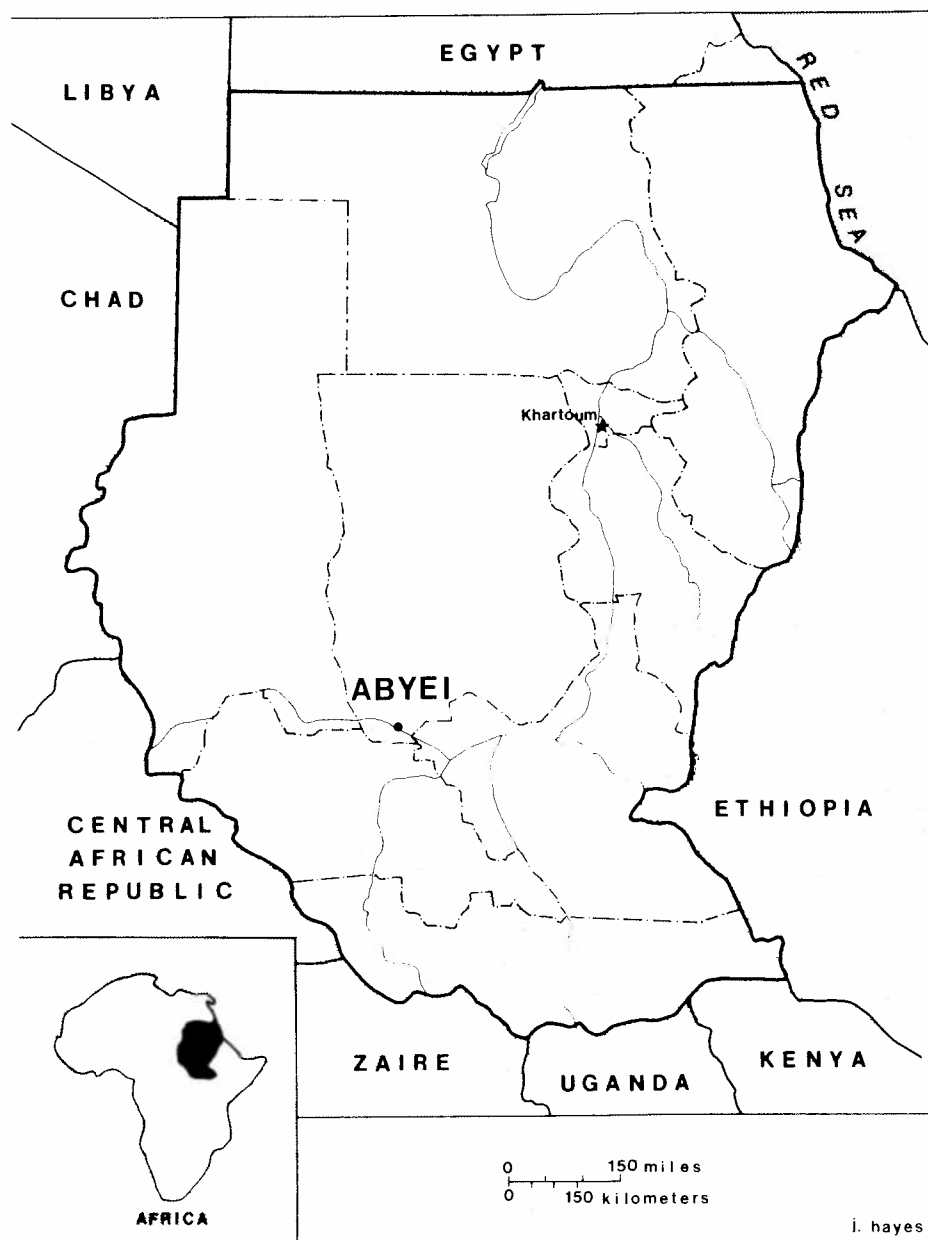
Introduction

This paper examines the consequences and limitations of the concept of "action research" and its application within a small-scale rural development project in the Sudan. Action research is a strategy whereby a development team is placed in the field and immediately begins to collect data, formulate strategies, and test various technologies and methods without a highly structured predetermined development plan. This approach should allow for some tangible result to occur in the community; at the same time it provides a flexible research component to assure that the final development plan will be suited to the local needs and environment. A brief review of the planning tradition from which development schemes evolve reveals how the concept of "action research" was derived and highlights its strengths in comparison with alternative methods. The Abyei Integrated Rural Development Project is reviewed with specific attention to the water development program.

Project Setting

The Abyei area is located some 600 miles SW of Khartoum in a remote section of Southern Kordofan. It is a microcosm of Sudan where sub-Saharan and Saharan Africa meet. Located in a wet-dry climatic zone with one growing season the environmental constraints are severe. During the wet season the heavy cracking clay expands to make the dirt-packed roads impassable. The remainder of the year, the soil has the characteristic texture of cement. Trade between the region and the rest of the country is limited to the dry season only. Communication with the modern sector is not formalized as there is no post office or regular mail delivery. Likewise there are no banks for credit or savings. Shortages of consumer goods, as well as staple items, are common before the roads reopen after the rains.

SUDAN



The region is inhabited by two distinct ethnic groups; the Nogk Dinka, a Nilotic speaking group and the Missirya Humr, an Arabic speaking people. Both groups have livelihood systems that rely heavily on livestock along with subsistence agriculture. The Dinka live in Abyei town and environs planting sorghum, the main staple crop, during the wet season. The Humr a more nomadic group, reside further to the north but both groups take their cattle south where adequate grazing land and water resources are more assured during the dry season. Armed conflict is frequent between the two groups because of the competition for the scarce water and grazing lands so vital for the survival of their cattle.¹

The project in question is a small scale integrated rural development program aimed at "increasing the physical, economic, and social well being of the people of the Abyei District" (Cole & et. al., 1977).² The project design came shortly after the end of the long and bloody civil war between the north and south had come to an end. Formulated in 1977, by Harvard Institute for International Development (HIID), its main components involved: agriculture, health, water resources, livestock, communication, vocational-educational training, and construction. The project's main funding comes from USAID with additional support from the Government of Sudan (GOS). The program is implemented jointly by HIID and the Sudanese Department of Agriculture. The original grant called for a two year program phase, but an additional eighteen months extension was granted along with an increase in funding. The project is now concluding the initial phase (June 1981) and its implementation and design remain controversial.

Action Research

To best understand the concept of action research it is helpful to examine the planning tradition out of which it grew. Cole has characterized development schemes into four broad types of approaches which can be termed: "master plan", "crash plan", "imported model", and finally the "pilot model".³ The "master model" is one in which extensive research and data collection are carried out prior to the project design phase. Usually a long range, all inclusive planning document ensues. This model requires

large capital expenditures and has a long time horizon. In the interim social and environmental changes may occur along with changes in funding sources rendering the plan inoperable. In response to the long time horizon of the "master plan", the "crash plan" evolved where by large teams of development experts devise a comprehensive plan in a short time span. The model as a result, may not reflect the complexities of the local ecosystems nor adequately assess the local needs. Another approach, which can be termed the "imported plan", is one in which a plan or project successful in one setting is modified to conform to the particular site requirements. This approach requires a good working knowledge of both cultural and environmental settings and may call for substantial modifications. Finally, the "pilot model" is an effort to carry out early implementation of obvious needs while testing methodologies for further development strategies. The main drawback with this approach is that these methodologies have usually been designed in advance and limit the perception of one's options. It is in response to this tradition that action research was formulated.

In the words of David Maybury-Lewis action research is "the technique of working out a regionally appropriate methodology, while living among, working and actively assisting the local population. It shares with a pilot project only the characteristic that both are supposed to be preliminary to a later, less tentative phase. It is distinguished from a pilot project in that the major lessons learned in action research and learned in situ" (David Maybury-Lewis, 1980).

HIID built the concept of action research into the original project design in October 1977 although it wasn't called that until a proposal for a grant extension and amendment in March of 1979. It was then seen "that research must be combined with action as that rural people who may not see the relevance of research will at least be receiving the benefits of development" (Cole, et. al., March, 1979).

The complexity of the proposed Abyei Project in great part hinges on its institutional setting. The project is run jointly by three main institutions:

USAID, GOS, and HIID. Each has a different set of objectives, motivations and responsibilities. USAID (Washington and Khartoum) was anxious to establish its presence in the Sudan after the conclusion of the civil war and the end of Sudanese brief dependence upon Soviet aid. Thus a rural development project funded by USAID would be one component of US involvement in the country. The hope was to reach the poorest of the poor and improve the standard of living in the rural areas. The commitment was to provide technical assistance and support over a two year period with a total budget of 800,000 US\$. The GOS (Khartoum, Kuduguli, Abyei) was interested in reconciliation between the north and south and wanted a model project to serve as an example for the nation of progress and harmony. They were to provide six counter-part staff plus 114,000 US\$ equivalent. HIID, an academic institution, was concerned with theories of development and up until this point had not applied these theories to a "grass roots" type of development project. The idea of a rural, low cost, action research, self-sustaining project was therefore an appealing one. HIID was responsible for the project design and was the only group with action research on the agenda. This was later to become one of the major friction points between HIID and GOS/USAID. The latter were to criticize HIID for an imbalance between research and action.

Although the project in its final form contains several components the focus of the next section is on one of these, the water program. A close examination of this component will allow us to see the evolution of action research in practice.

The Abyei Water Program

The basic physical water resources of the area are two main rivers: the Bahr El Arab and the Nyamora. In addition, there are several seasonal raguabas (wide streams) that dry up at varying rates during the dry season. The region has seven deep bore wells that service livestock as well as people (the exception to this is Abyei Town where livestock are not allowed). These are open on a limited daily basis and a fee is charged by the amount of watertaken. The bore wells are maintained by the GOS and are subject to frequent closures due to mechanical

breakdowns causing great hardship to the people being the only potable water source for the town.

The traditional response of the Dinka to the lack of adequate year-round water supply had been simply to close their houses and move to areas further to the south during the dry months. However when the GOS installed a deep bore well in Abyei town more people remained in the area on a year-round basis. In the outlying areas water is still a problem and women and young girls must walk long distances procuring only what they can carry on their heads for household use. Thus, water was identified during President Nimeiri's trip to Abyei in 1972 as one of the critical areas for improvement.

The project planners, that is HIID, identified the availability of water as a "controlling factor on the location of people during the dry season" (Cole, et al., 1977). They saw the provision of a year-round water supply as a way to "relieve hardship"⁴ and "produce a positive economic effect". This would come about in two ways: first by allowing those who leave to remain and pursue a viable economic activity, and second, by reducing the amount of time spent hauling water for those who would have otherwise remained. Their time would then be freed to engage in income-producing activities.

The original project design called for six hand-dug wells that would be 120-140' deep and lined with brick. This brick was to be manufactured by another part of the project. The Sudanese Rural Water Corporation was to supply the expertise while the people of Abyei would provide the labor source.

The use of local labor, the Dinka, to dig wells had to be abandoned due to strong cultural taboos. These taboos were centered around the Dinka belief that digging in the ground would disturb one's buried ancestors. Another factor contributing to the change of plan was the inability of the project to produce reliable quality brick, necessary for lining the wells.

The Rural Water Corporation did not provide the required technical assistance for the wells program and thus put HIID in a difficult administrative position since it was not able to operate independently. After a year HIID began to seek alternative methods to hand dug wells and resorted to mechanical drilling.

The HIID planners selected a motor driven hydrodrill and a hand pump (IRDC) using PVC pipe. These meet the requirements of: readily available (time constraints), low cost (financial constraints), light weight, (logistical constraints), and finally able to be portable. A well driller was hired and sent to the field in October 1979-January 1980. Owing to logistical delays the technician was not able to install any pumps. The next well driller arrived in March 1980. He was able to drill four wells and install hand pumps in two sites. Technical problems with the pumps were encountered immediately. There were design problems related to depth, tensile strength and metal fatigue. (The wrong size PVC pipe had also been shipped.) The IDRC pump, manufactured by a Canadian firm, had not been field tested under those harsh conditions or to that depth. A second type of hand pump, the India Mark II, was installed at a site where the water table receded and thus made it inoperable. While knowledge had been gained regarding drilling technologies, water table levels and hand pump technologies, the net effect after two years is that no additional water resources were available to the local people.

Critique

The Abyei Water Project can be critiqued in three areas of concern: social, technical and economic. One issue involved the local population's altering its behavior in response to the anticipation of the provision of water. This raised level of expectation was not met. The effects of this are best described by Claybaugh, (1980).

While the project has consistently told the people of Abyei that the intention of the program is to bring water, the project has nevertheless

acted in a manner consistent with the interpretation that the purpose of the water program is to experiment with alternative drilling and pumping technologies. The inconsistency between what has been said and what has been done has not escaped the notice of the local people. The considerable lack of esteem in which the Abyei Project is held by the people it is supposed to be helping is directly attributable to this perception.

Another social concern relates to a definition of the people of Abyei District, the target recipient of this project. This group includes two main and very distinct ethnic groups: the Nilotic Dinka, and the Arabic Humr. There was no attempt by planners to provide water on an equitable basis for both groups. One group, the Dinka residing in and near the town, received all of the development effort. It may be true that the time-distance constraints within the region did not allow for the limited staff to reach both groups. Tension between the Dinka and Humr mounted and reached such a level that HIID staff began expressing concern for their own personal safety.

On a technical level there are still difficulties in three areas. The first is installing a hand pump system that will hold up under the harsh environmental conditions. The second is drilling deep enough to be sure of tapping a year-round water supply. The third is establishing a system for long term pump maintenance and parts procurement in such an isolated area. If the project is to be self-sustaining this last issue can not be overlooked.

The economic considerations raise a series of questions also. Who will pay for maintenance and spare parts? Will the local people using the wells be charged at the same rate as those using the bore well in town? But a more subtle question relates to the site selection of additional pumps placement. With the planned expansion of the wells program, site selection of these additional

pumps must be determined. HIID planners are suggesting that site selection be made on an economic basis, (by those willing and able to pay the cost). Stated and implied goals of the project are to provide for basic human needs and to reach the truly poor. So long as the main criteria for site selection remains economic in nature, those most in need of assistance will be effectively overlooked.

Conclusions

The process of development, especially in an isolated rural setting, has the potential for great impact on the local population. Just the fact that a project is initiated in such an area raises the interest and expectations of the people for kilometers around. Communication and interaction at the early stages between planners or development workers and the local people is critical. The difference between action and research must be somehow made clear to avoid unrealistically raising the local people's level of expectation. Once the basic levels of expectation are raised modification is more difficult. This was demonstrated in the water program.

While data are being collected an initial low profile by the project is needed. Careful selection of the action component to avoid an ad hoc approach can help to focus the project. Along with this, the stated goals of the action portion must be proportionate to the time, staffing and budgetary constraints of the project. In this way the local people would be better assured of receiving the initially anticipated benefits.

Project success at the outset is equally important. This helps build a working relationship between the donor and the recipient. Skilled leadership is also crucial at this initial phase to help establish this trusting relationship and to open lines of communication between the technicians and local people.

The concept of "action research" is basically a sound one. It has several advantages over the more conventional planning modes. The flexibility inherent in the initial phase allows for the site specific re-

quirements unique to each project to be met. Programs or techniques that work out well in the early phases can then be expanded upon with prior experience and some assurance of success and appropriateness. The action component allows the people of the community the opportunity to have some concrete results early in the project phase.

Various problems still exist: notably raising of people's expectations over ambitious goals in the initial phase, and the necessity to balance the research - action component and "expert" opinion with strong local communication links. Some research must be done at the outset to consider the types of local impacts which can undermine the intent of the action component.

Footnotes:

- ¹Cattle in this setting, in addition to being the traditional means of achieving prestige, are a form of investment, saving and security against hard times.
- ²The area included in Abyei District is under dispute and no clear boundaries are agreed upon.
- ³The approaches described in this section are based in part on a paper written by David Cole and David Vail, 1980.
- ⁴During the dry season, especially towards the end when all local natural supplies had dried up, the day time high temperatures would be well over 100 F., sometimes for weeks at a time. Women & girls were responsible for drawing water on a daily basis since water storage systems beyond large clay pots were uncommon.

References:

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Current research

WORCESTER THREE-DECKER STUDY

A team of historical geographers at Clark University has completed an architectural survey of Worcester's three-deckers. Named for their characteristic three-floor porches, or 'decks', these large, wood-frame structures were built to house a rapidly expanding urban immigrant population drawn to Worcester during its period of booming industrial growth in the late 19th and early 20th centuries. These dwellings continue to dominate the landscapes of many of the city's neighborhoods today.

The project was funded by the Massachusetts Historical Commission and sponsored by the Worcester Heritage Preservation Society. The survey team, including John Callahan, Mona Domosh, Douglas Johnson, Montine Jordan, Joni Seager and Michael Steinitz, recorded the architectural features of more than 4,000 three-deckers remaining in Worcester. The work contributes to an improved understanding and appreciation of a long neglected and sometimes disparaged vernacular housetype.

Michael Steinitz

INTERNATIONAL DEVELOPMENT

The International Development Program has been involved in several research activities over the past academic year, 1980-81.

First, the Environmental Training and Management in Africa (ETMA) project has been undertaken cooperatively with the Department of Environmental Sciences at the University of North Carolina and the Southeast Consortium for International Development (SECID). We have jointly obtained about \$8.5 million from the US Agency for International Development and about \$2.5 from African Governments for research over a five year period. ETMA has a dual purpose. One cluster of activity assists planners and resource managers in four countries (Botswana, Kenya, Sudan, and Tanzania) to plan and manage their resources more effectively. A second focus is training. Short, medium and long-term courses on a variety of themes are offered in collaboration with African institutions in at least twelve countries. These themes include:

- identifying environmental problems
- environmental education and awareness
- environmental aspects of urban and rural development
- agricultural production, agro-forestry and energy
- environmental aspects of rural health
- environmental monitoring
- environmental aspects of industrialization
- techniques of environmental impact assessment
- techniques of water quality control
- resource management in semi-arid regions

A second area of activity is supported by a recent grant from the Exxon Foundation. This Foundation had made funds available for the ID Program to offer three month-long seminars (June of 1982, 1983, and 1984) which will bring together graduate students presently studying in the United States in a variety of development-related fields, who come from Least Developed Countries and who wish to receive training in techniques of resource planning and management in the context of least developed countries. Our research and work

in Africa has determined that one of the greatest constraints facing development policies in the least developed countries is the resource base. Yet few graduate programs in the US address these issues in ways that are meaningful to students who eventually will be planners and decision makers in the approximately 50 nations which the UN lists as the world's poorest nations. This training effort is jointly endorsed by the US Department of Agriculture, the US National Parks Service, and UNESCO's Man and the Biosphere Program. We hope that it will be self-financing at the conclusion of the Exxon funding.

In addition, the Exxon Foundation is supporting a newsletter which ID circulates to colleagues and counterpart agencies in the US and in other parts of the world. Known as the Network for Environment and Development, the newsletter serves as an exchange for information and experience among researchers and planners who seek more effective ways to improve resource management in development planning.

Third, a project recently completed with US AID involved assisting country programs in Eastern Africa. ID produced a profile of major development issues for each of the region's nine countries and began to identify development problems which are common to the region and which may be addressed by a regional rather than country-by-country strategy. The first of the regional issues ID has researched is the interface between and among the trends in food, population and energy. This analysis has included a literature review as well as recommendations for the nine country missions. It may lead to a much broader effort to analyze food, energy and population trends within Eastern Africa's several ecological and food system zones. In addition, the Central Africa office of AID has become interested in the regional concept which we are using in Eastern Africa and has invited ID to enter into preliminary discussions about ways in which issues common to, for example, Zaire, Cameroon, Rwanda and Burundi, may form the basis of regional analysis and development policy.

Barbara Thomas

CLIMATE AND SOCIETY RESEARCH GROUP

The formal research on the Great Plains Climate and Population Project (CLIMPOP) ended in the spring of 1981. In a number of case studies of counties in the Great Plains, it was established that modern agriculture has adapted to the drought hazard and lessened the impact of dry years.

The mechanisms of "lessening" were examined by William Riebsame in two spring wheat areas of North Dakota including summer fallow, farm diversification, federal disaster payments and crop insurance.

Danny Wiener evaluated the possible impacts of drought in the Great Plains on world food supplies. Crop yields were estimated for a simulated drought of the type experienced in the 1930's and used as input into a model developed at the University of Southern California. The indications are that a severe drought might have serious impacts, particularly on Third World countries.

Tom Downing prepared a drought climatology of Eastern Africa with Len Berry for a meeting of the US AID mission directors. No widespread trend in rainfall was noted, but in several areas variability has increased in recent years.

Under the direction of Robert Kates, Clark University has become the center for a new climate and society project. As part of the World Climate Program, the Scientific Committee on Problems of the Environment (SCOPE) has undertaken an authoritative review of climate impact assessment focusing on the issues of theory, substance and method. The review draws upon a Scientific Advisory Committee, review authors and national correspondents from around the world. Experts will prepare review papers for discussion at a meeting in September of 1981, with late publication by John Wiley & Sons as a volume in the SCOPE series.

Tom Downing

HAZARDS ASSESSMENT GROUP

For the last five years, the Hazards Assessment Group at CENTED has sought to identify the common and differentiating characteristics of the entire domain of technological hazards in order to simplify their analysis and management. The major thrust of the research has been to attempt to classify hazards on 12 scales related to causal structure. Using factor analysis, a five-factor profile of each hazard is constructed. These five factors explain about 81% of the variance of the sample and are INTENTIONALITY, PERSISTENCE/DECAY, CATASTROPHIC POTENTIAL, ANNUAL MORTALITY and GLOBAL DIFFUSENESS. Technological hazards, therefore, can usefully be measured by a number of social, physical and biological descriptors. The expectation is that a multi-variate profile of hazardousness can help improve the quality and effectiveness of hazard management.

Murdo Morrison

The Clark community

DIRECTOR

Leonard Berry, Ph.D., University of Bristol, 1969.
Professor of Geography, Co-Director International
Development Program. Applied geomorphology.

PROFESSORS

Martyn J. Bowden, Ph.D., University of California,
Berkeley, 1967. Professor of Geography, Director
of Humanities Program, Historical-Cultural, Urban
Environmental Cognition. Reconstruction following
disaster.

Anne Buttner, Ph.D., University of Washington, 1965.
Professor of Geography, Social, urban, social space,
philosophy of geography.

Gerald J. Karaska, Ph.D., Pennsylvania State Univer-
sity, 1962. Professor of Geography. Editor of
Economic Geography. Urban/Economic.

Roger Kasperson, Ph.D., University of Chicago, 1966.
Professor of Geography and Government. Urban-
political, decision-making, nuclear risk assessment.

Robert W. Kates, Ph.D., University of Chicago, 1962.
Professor of Geography and Research Professor in
the Center for Technology, Environment and Develop-
ment. Environmental perception and management,
resource development, risk assessment, early child-
hood education.

Duane S. Knos, Ph.D., University of Iowa, 1956.
Professor of Geography. Geography and its teaching,
urban, simulation as a learning process.

PROFESSORS (continued)

William A. Koelsch, Ph.D., University of Chicago, 1966. Professor of Geography and History and University Archivist. Historical, history of geographic thought.

Harry E. Schwarz, BCE, George Washington University, 1964. Environmental Affairs, Water Resources Planning, water reuse.

ASSOCIATE PROFESSORS

Douglas L. Johnson, Ph.D., University of Chicago, 1971. Associate Professor of Geography. Cultural, landscape, economic development, pastoralism, Middle East.

Laurence A. Lewis, Ph.D., Northwestern University, 1965. Associate Professor of Geography. Geomorphology, slope processes, fluvial processes.

J. Richard Peet, Ph.D., University of California, Berkeley, 1968. Associate Professor of Geography. Social, economic, community planning, Marxist geography.

Harry J. Steward, Ph.D., University of Wales (Swansea) 1972. Associate Professor of Geography. Cartography. Remote sensing, imagery.

Billie Lee Turner, II, Ph.D., University of Wisconsin-Madison, 1974. Associate Professor of Geography. Cultural ecologist with specialty in tropical ecology, agriculture and pre-history.

ASSISTANT PROFESSORS

Susan Hanson, Ph.D., Northwestern University (Illinois) 1973. Assistant Professor of Geography. Co-editor of Annals of the American Association of Geographers. Urban Social Geography and Quantitative Methods. Travel-Activities Patterns.

ASSISTANT PROFESSORS (continued)

Kirsten Johnson, Ph.D., Clark University, 1977. Assistant Professor of Geography. Cultural ecologist with a specialty in cognitive components of human-environment inter-actions.

Sharon E. Nicholson, Ph.D., University of Wisconsin, 1976. Assistant Professor of Geography. Climatology.

RESEARCH PROFESSORS

David C. Major, Ph.D., Harvard, 1966. Research Professor. Water resource economics.

ADJUNCT PROFESSORS

Saul B. Cohen, Ph.D., Harvard, 1955. President, Queens College. Adjunct Professor. Political geography, educational networks.

Dennis W. Ducsik, Ph.D., MIT, 1976. Assistant Professor of Science, Technology and Society. Management of energy technology and coastal zone management.

PROFESSORS EMERITI

Raymond E. Murphy, Ph.D. Professor of Geography.

Henry J. Warman, Ph.D. Professor of Geography.

STAFF

Michael Dulka, Map Librarian
Katherine Parella, Administrative Assistant
Cartographer and Cartography Lab. Manager

SECRETARIAL

Ruth Garabedian
Madeleine Grinkis
Elsie C. Sullivan

Economic Geography - Louise Corbett
 Natural Hazards - Jane Kjems

In addition to the regular faculty, the School of Geography each year has Research Affiliates in residence or off-campus. For 1981-1982 these include: Mildred Berman, Salem State College; Daniel Dworkin, U.S. AID.

GRADUATE STUDENTS

Anwar Abdu, Geomorphology.
 Janice Albert, ID/Agriculture
 Abdalla Alghahaity, Regional/Physical
 Abdul Benkhial, Political/Cultural
 Andrew Bomah, Geomorphology
 John Callahan, Historical Geography
 Raban Chanda, Resources/Management
 Lee Campbell, Cultural
 Jonathan Cheney, Cultural/Humanistic
 Mona Domosh, Historical/Cultural
 Tom Downing, Hazards/Resources
 Ute Dymon, Cartography
 Michael Enbar, Policy Issues
 Anne Gibson, Cultural/Cartography
 Phyllis Giordano, Urban Planning/Economic (retail location)
 Anne Godlewska, History/Cartography
 Arnold Gray, General Geography Ed.
 Thomas Harris, Technical Change/Environmental
 Jane Hayes, General
 Richard Hosier, Inter. Dev./ Resources
 Gloria Johnson, Economic Geography
 Mark Johnson, Inter. Dev./Cultural Geography
 Montine Jordan, Cultural/Cartography
 E. S. Kalapula, Inter. Dev.
 Cindi Katz, Cultural/Humanistic
 Martin Koepl, Env. Perception/Philosophy of Geography
 Susanna Leers, Environmental Management/Biogeography
 Jimmy Levy, Urban/Environmental Management
 John Lundblad, Environmental/Inter. Dev.
 James Lyons, Political/Geog. Ed.
 Ophelia Mascarenhas, Communication/Inter. Dev.
 Thomas Millette, Remote Sens./Cart. Physical/Envir.
 Murdo Morrison, Resources/Environmental Management
 David Munaserei, Geomorphology
 Francis Odemerho, Geomorphology
 Richard Perritt, Inter. Dev.

GRADUATE STUDENTS (continued)

Eugenie Rovai-Williams, Inter. Dev./Latin America
 Barry Rubin, Environmental Politics/Hazard Management
 Joni Seager, Historical
 Izhak Schnell, Urban/Social Geog.
 Eliaz Shlomi, Cartography/Inter. Dev.
 Michael Steinitz, Historical/Cultural
 Nancy Villanueva, Regional
 Daniel Weiner, Resources/Hazards
 Nancy Winter, Geog. Education
 Richard Wright, Political/Social/Economic

SPECIAL GRADUATE STUDENT

Uwe Herrmann, Regional/Economic Cartography

GRADUATE STUDENTS IN ENVIRONMENTAL AFFAIRS

Clifford Ageloff
 M. R. Anderson
 Joan Beskenis
 Ronald Blanchette
 Steven L. Cooperman
 Keith J. Cronin
 William Dilibero
 Sam Edwards
 Karro Frost
 Kurt Kallmeyer
 Lisa K. Morla
 Debra Pincus
 David Rabinovitz
 Bonnie J. Ram
 Ronald Shems
 Caroline Woolner

Recent Enrollments

During 1980-81 there were in residence 39 graduate students in varying stages of their program, 9 of whom were first-year students. There were 39 non-resident students actively engaged in completing their degree work; 91 undergraduate majors, and an additional number of undergraduates who included Geography as part of their dual major.

Graduate and undergraduate students were involved with faculty in special projects related to International Development; Man-Environment Studies; Natural Hazards Research; Environmental Affairs; Networks; Risk Assessment; Nuclear Energy Research; Urban Community Analysis and Curriculum Development in the Humanities.

Ph.D. degrees were awarded to the following students with dissertation titles noted in parentheses and first jobs noted thereafter:

Vernon Albert Domingo, (The Underdevelopment of Ex-Colonial Immigrants in Metropolitan Society: A Study of Surinamers in the Netherlands). Bowling Green State University, Bowling Green, Ohio.

Ruth B. Fincher, (The Local State and the Urban Built Environment: The Case of Boston in Late Capitalism). McGill University, Montreal, Quebec, Canada.

Tim William Hudson, (The Politics of Industrial Development in Mississippi: A Spatial Analysis). Mississippi Research and Development Center, Jackson, Mississippi.

Branden B. Johnson, (Congress as Hazard Manager: An Analysis of Legislation on Technological Hazards, 1957-1978). Department of Geography, University of Pittsburgh, Forbes Quadrangle, Pittsburgh, PA 15260.

Bret McLean Halverson, (The Concept of Individual Difference in Adolescents and Its Relevance for Urban Geographical Education). Bank St. College of Education, 610 West 112th St., New York, NY 10025.

Arthur Krim, (Imagery in Search of a City - The Geoscopy of Los Angeles). Mass. Historical Commission, 294 Washington Street, Boston, Massachusetts.

Perry Massey, (A Comparative Spatial Analysis of the Processes of Black Suburbanization in the SMSAs of Cleveland, Birmingham, and Seattle-Everett). Department of History & Philosophy, Virginia State University, Box 4002 - N. Petersburg, VA.

William Edward Riebsame, (The Mechanisms of Lessening Drought Impacts on the United States Great Plains). University of Colorado, Boulder, Colorado.

Stephen W. Sawyer, (Residential Solar Energy Use: A Comparative Assessment by Solar Consumers and the Solar Research Community). Department of Geography, University of Maryland, College Park, MD 20742

Paul H. Susman, (Problems of Regional Decline in Advanced Capitalist Countries: The Case of Northeast England). Bucknell University, Lewisburg, PA.

Joseph B. Thornton, Jr., (The Agricultural Transformation of 19th Century Jamaica: A Microgeographic Study of the Decline of the Plantation System and the Emergence of the Small Farm System in the Parishes of St. Andrew and St. Thomas). Columbia Teachers College, Washington, D.C.

Abraham Zahavi, (Movement of Bed Material in a Small Reach of a Perennial Stream).

MASTER OF ARTS degrees were awarded to the following students:

Ann Dennis, (The Role of the Family Farm Form of Organization in the Structure of U.S. Agriculture).

Katherine D. Gibson - predoctoral.

Paul Hideo Kariya - predoctoral.

Cindi R. Katz - predoctoral.

Robert Obeiter, (The Effect of Attitudes on Residential Water Consumption) - Environmental Affairs.

Francis Obukohwo Odemerho, (The Dynamics of Stream Hydraulic Variables: Implications for Planning Traditional Agriculture in Southwest Nigeria).

Lewis Daniel Rosenthal, (A Geographical Model for Political Systems Analysis).

Larissa Hanuszczyk-Sacovitch, (The Influence of Long Distance Trade on Medieval Kiev and Its Settlement Pattern From the Seventh to Mid-Thirteenth Centuries).

Daniel Weiner, (Exploring the Potential Global Consequences of a Recurrence of a 1930's Magnitude Drought in the United States Great Plains).

MASTERS THESES in Environmental Affairs:

Marta Mavretic, "Multiobjective Analysis Application to a Classic River Basin Planning Process."

Jane Sales Mika, "The Impact of an Incinerator Residue Landfill on the Soil Algal Community of a Freshwater Urban Wetland."

James Melville Arnold, "The Role of Regional Planning in Central Massachusetts."

Lynn E. Frederiksen, "Agriculture, Erosion Control and Coastal Watershed Management: An Integrative Development Approach for St. Croix, V.I."

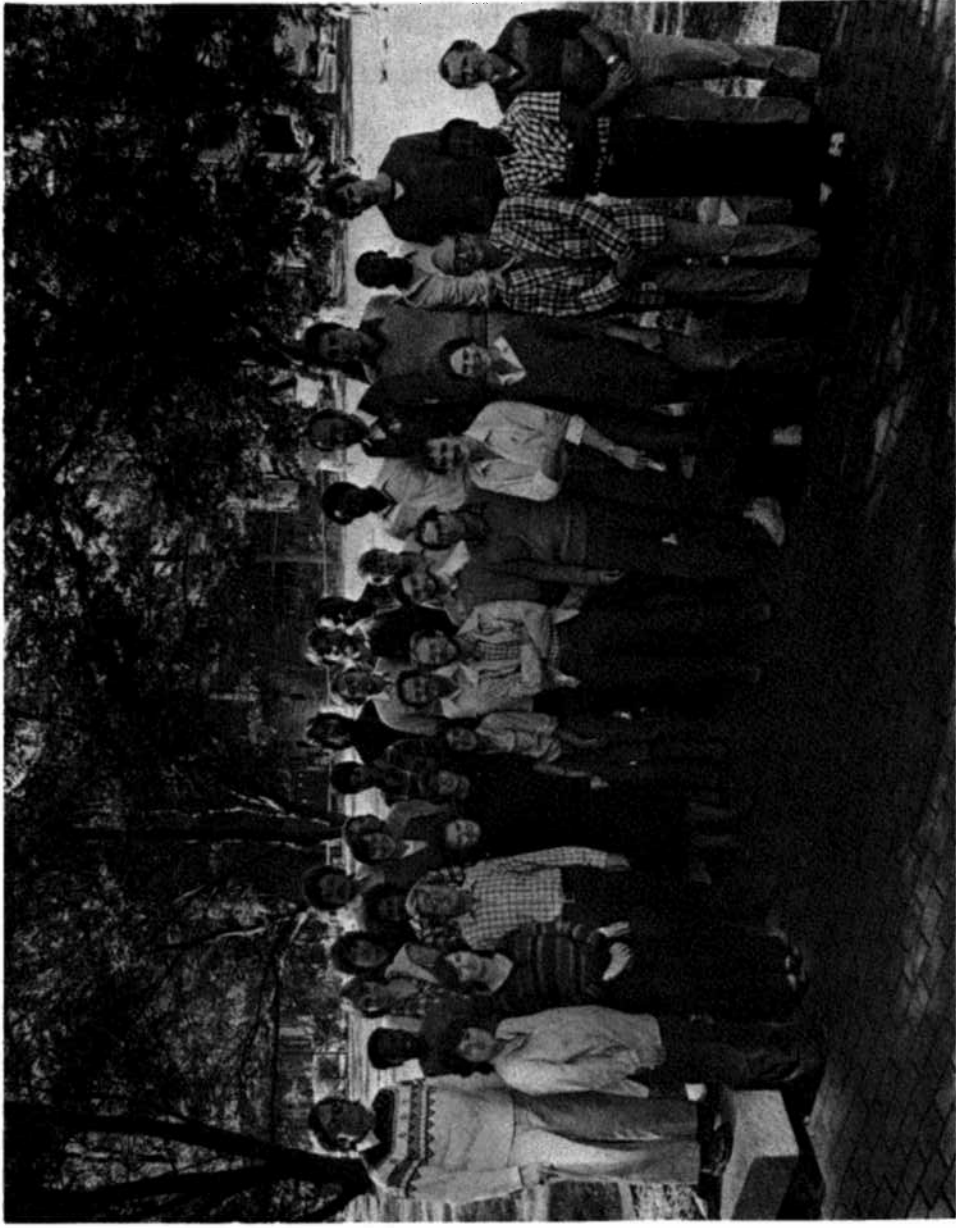
MASTERS THESES in International Development

Richard H. Hosier, "Mexican Squatter Settlements: A Simulation of the Effects of Municipal Housing Policies on the Ability of Squatter Households to Consolidate."

Oliver Wendell Hunter, "Socio-Environmental and External Dependency Consideration of Largescale Hydropower Based Industrialization."

Leonard Joel Kreppel, "The Political Economy of Famine: Case Studies of Bengal, Ethiopia, and Dihar."

Haleh Pourafzal, "Comparative Vulnerability to Drought in the Sahel, 1910-1914 and 1968-1974."



Graduate School of Geography 1981

Front Row (Left to Right)

Lee Campbell, Kay Parella, Michael Dulka, Jane Kjems, Kirsten Johnson, Joni Seager, Len Berry, Barry Rubin, Jim Lyons, Bob Kates, Martin Koeppl, Susan Hanson, William Koelsch, David Munaserei, Billie Lee Turner, II.

Back Row (Left to Right)

Murdo Morrison, Gloria Johnson, Susanna Leers, Jane Hays, Ophelia Mascarenhas, William Riebsame, Anne Buttiner, Mona Domosh, Nancy Villanueva, Michael Enbar, Richard Perritt, Tom Downing, Emil Kalapula, Anne Godlewska, Raban Chanda, Mark Johnson, Uwe Herrmann, Tendani Mathivha, Richard Wright.

Photo credit: Robert Koerner

Field camp, September 1981

After a five-year lapse, the traditional Graduate School of Geography field camp returned this fall with a four-day trip to Cape Cod. Here is a personal reminiscence.

The trip began Thursday morning on a particularly auspicious note - we were only fifteen minutes late, a new department record! A caravan of six cars full of twenty-odd (twenty odd?) graduate students and one brave faculty member, Harry Schwarz, sped out of Worcester. Why record the litany of car problems which took place next? Let us pass on to the group's first stop, picking up the story with them at the Cranberry Experiment Station in East Wareham. There we were treated to the reminiscences of Dr. Chester Cross who shared with us his years of experience working on, living with, and perhaps in, cranberry bogs. We spent a pleasant afternoon in Woods Hole gazing out over the ocean, conducting preliminary investigations into the spatial distribution of ice cream stores and other important geographical questions of that ilk. The presentation on off-shore drilling in Georges Bank was most interesting too!

We arrived at Starfish Cottages in Eastham in time to prepare and consume dinner before settling into our cottages, our home base for the next three days. Our first evening was spent discussing water quality on the Cape with Clark Alumnus Bob Black, and, later, meeting our cottage-mates, imbibing under the stars and fighting off the mosquitos!

The following two mornings we examined coastal flood hazard perception and coastal erosion on the outer Cape, under the competent direction of Tom Downing and Bill Riebsame. We interviewed town selectmen and trailer camp occupants, witnessed the devastating power of the 1978 winter storm at Coast Guard Beach, and experienced coastal erosion first-hand as we carefully descended a stairway which was precariously balanced on an eroding beach cliff.

On Friday afternoon we viewed the film "Portrait of a Coast" which vividly portrayed coastal processes and their relation to human settlement. Certainly the culinary highlight of the trip was dinner that evening - a multiple-course meal, artfully prepared and actually survived by all. Faculty members Bill Koelsch and Dick Peet joined us for a lively, and as the evening progressed, "spirited" discussion concerning perspectives on land use conflicts of the Cape.

Saturday lunch found us lolligagging on the Herring Cove Beach, enjoying our last relaxing moments before we marched off for a three-mile, two hour beach hike with a naturalist from the Provincetown Center for Coastal Studies. We learned about amophila (beach grass) and least terns (beach-nesting seabirds), and the impact of large pedestrian groups on the dunes, but by the last half mile, our minds were more intent on burning feet and scorched throats. Hardy geographers all, we pushed on, propelled by the enticement of a night in P-town. Bill Koelsch provided an informative and leisurely walking tour of the west end of Provincetown, and then left us to our own devices for the evening.

By Sunday, after three days of hearing about and carefully examining the coast, we were ready to experience it first-hand, so we headed to the beach and the cold ocean waves before our departure that afternoon. Our last stop was in Mashpee where Reed Stewart, a Clark alumnus, guided us through the Lowell Holly Reservation.

Throughout our four-day trip, we were reminded of the issues relating to the Cape's fragile environment: off-shore oil drilling, ground water contamination, tourist development, the use of off-road vehicles, protection of the beaches. The trip managed to combine both intellectual stimulation and an opportunity for new and old members of the department to become acquainted.

Mona Domosh

Alumni news

ALLEN, AGNES M. (MA 34, PhD 37), is Professor Emeritus at Northern Arizona University. She has done volunteer work with the Regional Council on Aging.

ANDERSON, JEREMY has been conducting research on the short run impacts of volcanic ashfall on human activity in east Washington State following the Mount Saint Helen's eruption. He is serving as Secretary-Treasurer of the Association of Washington Geographers and currently is Professor of Geography at Eastern Washington University.

ATWOOD, WALLACE W., JR. (MA 27, PhD 30) is retired and living in Virginia.

BALTENSPERGER, BRAD (MA, PhD 74) is Associate Professor of Geography at Michigan Technological University. He has recently presented a paper at the IGU Commission on Rural Development Symposium in Fresno, California and has received grants from DOE and MTU. His current research interest is agricultural adjustments of Russian Germans on the Pampas. His second child was born in October of 1980.

CHAMBERLIN, THOMAS W. (MA 37, PhD 46) is Professor of Geography at the University of Minnesota, Duluth.

CREVELING, HAROLD F. (PhD 51) is retired and living in Oklahoma. He is currently teaching a class in Geography for senior citizens and has received several community awards for his volunteer efforts. He still finds time, however, to continue his hobby of painting.

CUNNINGHAM, FLOYD F. (AM 28, PhD 30), is retired and living in Carbondale, Illinois. He is currently working on books on the Middle East and Illinois.

- DEAN, VERA K. (MA 40, PhD 49), is enjoying retirement in Martha's Vineyard.
- DEEBEL, WILLIAM R., is retired and living in Shenandoah, Pennsylvania.
- DEJONGE, COEN K. (BA 47, MA 49, PhD 51), is Professor of Geography at San Diego State University.
- DIETRICH, SIGISMOND deR, (PhD 31), is retired and living in Gainesville, Florida. He is currently President of the Foundation for the Promotion of Music and is active in the cultural activities of Gainesville.
- DONNELL, ROBERT P. (MA 71), received a PhD in Geography and Metropolitan Studies from Syracuse University in June of 1980. He continues research on urban fire hazard problems. He has been revising and editing textbooks for John Wiley Publishers and is Massachusetts State representative to the Executive Committee of NESTVAL (1979-81). He is currently Assistant Professor of Geography at Framingham State College.
- ENDERS, MICHAEL J. (MA 76, PhD 76), spent the last year at the Institut d'Urbanisme de Paris where he taught and conducted research as Fulbright scholar. He is currently Assistant Professor of Urban and Regional Planning, University of Wisconsin, Madison. Recent publications include: "La qualification professionnelle des planificateurs aux Etats-Unis," *Metropolis*, Vol. 6, No. 46-47 (1981), pp. 76-81; "Housing and Settlement Patterns in Central Tunisia: An Example of the Conflict Between the Individual and the Organization." *EKISTICS* (May, 1981); "Condominium Development in Wisconsin: A Growing Issue." Occasional Paper No. 2, University of Wisconsin, Madison, Department of Urban & Regional Planning (January, 1981). His third daughter was born in January of 1981.

- ISK, BRADLEY, JR. (MA 52), is Associate Professor in Geography, History and Political Science at Cape Cod Community College. He recently presented a one-man exhibition, "Figures in the Landscape; a Geographer's Camera."
- GIRGIS, MONIR S. (PhD 57), is Chairman, Department of Geography and Environmental Studies, Edinboro State College, Pennsylvania.
- GLEDHILL, THOMAS E. (MA 67), teaches Earth Sciences at Burrillville Junior and Senior High School in Rhode Island. He has a continuing interest in developing energy-related curricula for local use.
- GOULD, LOREN (AB 53, AM 59), is Director of Institutional Research at Worcester State College. and is in his twenty-second year of service to that institution.
- HALVERSON, BRET (MA 79, PhD 80), is Director of the TIORATI Workshop for environmental learning and a faculty member, Graduate School of Education, Bank Street College of Education.
- HAUK, SISTER MARY URSULA RSM (PhD 58), is retired and living in Pennsylvania.
- HECOCK, RICHARD (PhD 66), is Professor and Chairman of the Department of Geography, Oklahoma State University. He is continuing research on patterns of recreational behavior and methods for measurement of recreational use for rivers.
- HESSEN, WILLARD C. (MA 50), is retired and living in Florida. He is enjoying hunting, fishing and golf.
- HUNTER, ESTHER KINCH (MA 40), is a homemaker and was recently awarded a badge for a solo soaring flight.
- JAMES, PRESTON E. (PhD 23, LLD 68), is Maxwell Professor Emeritus at Syracuse University. Recent publications include: "One World Divided" co-authored with Kempton Webb and Eileen W. James; "History of the Association of American Geographers", with

co-author Geoffrey Martin; the second edition of "All Possible Worlds" with Geoffrey Martin. In June, 1980, he received the Queen's Medal from the Royal Geographical Society, London, England.

- JOHNSON, BRANDEN (PhD 80), is Assistant Professor, University of Pittsburgh, Department of Geography. Recent publications include: "Federal Wastewater Reuse Policy: Institutional and Attitudinal Obstacles to National Progress," Resource Recovery and Conservation, May 1980, 179-193.
- KIRCHER, HARRY B. (PhD 61), is Chairman of the Department of Earth Science, Geography and Planning at Southern Illinois University. Recent publications include: "A Geography Program for Environmental Jobs," a paper presented at the Annual Meeting, AAG, Los Angeles, California; with co-author Donald L. Wallace, "Our Natural Resources" (5th edition).
- KISTLER, ESTHER L. (MA 38), is retired and living in Nanticoke, Pennsylvania.
- KLUGMAN, LAURENCE (MA 74, PhD 74), is Director of the Council for Educational Priorities, Philadelphia, PA. Recently he has developed and implemented a method for delineating nursing home service areas in the five county Philadelphia health service area.
- KRIM, ARTHUR J. (BA 65, PhD 80), is a cultural geographer working with the Massachusetts Historical Commission in Boston. He is currently Vice-President of the Society for Commercial Archeology. He is engaged in an historical survey of Eastern Massachusetts and Boston areas.
- LEMAIRE, MINNIE E. (MA 32, PhD 35), is Emeritus Professor at Mount Holyoke College in Massachusetts.
- LEWIS, TOM is Professor of Geography at Manchester Community College in Connecticut. Recent publications include: Near the Long Tidal River, University Press of America, 1981; "Declining Cigar Tobacco Production in Southern New England," Journal of Geography, March, 1980. He is now

working on Connecticut: A Geography, to be published by Westview Press in 1983.

- LOPEZ, MANUEL H. (AB 41), is retired and living in Florida.
- LYONS, SISTER MARION (PhD 63), is retired and living in Wellesley, Massachusetts.
- MAIER, EMMANUEL (PhD 61), is Professor of Geography at Bridgewater State College and recipient of the Distinguished Service Award from that institution.
- MASSEY, PERRY A. (MA 72, PhD 81), is on the faculty of Virginia State University's Department of History and Philosophy. He is interested in transportation problems and the needs of residents of low-income housing units in dispersed suburban and country locations.
- MERRIAM, FREDERICK S. (AB 39, MA 46), is a registered representative of Waddell and Reed, Inc.
- MINOGUE, JAMES A. (MA 36), is a member of the Board of Wayside Foundation for the Arts; Vice-President, Blue Ridge Chapter, Virginia Museum of Fine Arts and a member of the Steering Committee, Lord Fairfax Planning District Study of Rural Mass Transit requirements of Northern Shenandoah Valley. He continues to be active in horticultural organizations and during 1980 traveled extensively in the Appalachians, Northern Midwest and Ontario.
- MONIER, CLARA P. (MA 66), is Director of the New Hampshire State Council on Aging. She is a delegate to the White House Conference on Aging and a member of the National Seniors Advisory Committee for Reagan-Bush.
- MONKIEWICZ, WOJCIECH (MA 51), is a geographer with the Department of Defense. His recent publications include works on transportation and military geography.
- MORRILL, ROBERT W. (PhD 73), is Assistant Professor of Geography at Virginia Polytechnic Institute and State

University.

MOULTON, BENJAMIN (AB 39), is in his 18th year as Chairperson of the Department of Geography and Geology at Indiana State University in Terre Haute.

MURPHY, RICHARD E. (PhD 57), is Professor and Chairman of the Department of Geography, University of New Mexico.

OHMAN, HOWARD L. (AB 47, MA 49), is retired and living in Worcester, Massachusetts.

OLSON, RALPH E. (PhD 46), is Emeritus Professor of Geography at the University of Oklahoma. He continues his interest in the Grand Duchy of Luxembourg and plans to return there during 1981.

PARSON, RUBEN L. (MA 34, PhD 43), is retired and living near Chitherrall Lake, Minnesota. Recent publications include: Ever the Land: A Homestead Chronicle, 1978, Adventure Publications. He was recently elected Distinguished Alumnus at Moorhead State University. He also tells us that his autobiography is merely well begun, his time being taken with enjoying his home and garden.

PICO, RAPHAEL (MA 34, PhD 38), is retired and living in Puerto Rico. He was recently elected as Councilor of the American Geographical Society in New York and is also a fellow of the Explorers Club.

PIKE, RICHARD J. (MA 63), is currently a geologist with the U.S. Geological Survey. Recent publications include several papers on planetary impact craters and a short book, Geometric Interpretations of Lunar Craters (published as a USGS Professional paper). He writes asking us to tell you he is living the good life in sunny California, which includes rewarding research in congenial surroundings and tinkering with a couple of antique Porsche automobiles.

RISTOW, WALTER W. (PhD 37), is retired and living in Virginia. He has a continuing interest in the history of commercial cartography in the U.S. in the 19th century.

ROSENTHAL, LEWIS B. is retired and living in Hyatsville, Maryland. He tells us he is keeping fit, doing artwork and thinking of more to do.

SEAMON, DAVID (PhD 77), is Visiting Assistant Professor at the University of Oklahoma. Recent publications include: A Geography of the Lifeworld, St. Martins Press, 1979 and The Human Experience of Space and Place, (co-edited with Anne Buttner), 1980. He was recently elected a director of the Environmental Perception Specialty Group of AAG.

SHIN, SUK-HAN (MA 68), is Associate Professor of Geography and Adjunct Associate Professor of Urban and Regional Planning at Eastern Washington University. Recent publications include: The Impacts of Industrial Development on Socio-Economic Environments, Korea to be published by the Korea Research Institute for Human Settlements, Korea. He was recently Visiting Research Fellow at the Korean Research Institute for Human Settlements in Seoul and awarded a City Medal of Metropolitan Seoul for his role in an international urban planning conference - The Year 2000: Urban Growth and Perspectives of Seoul.

SMILNAK, ROBERTA ANN (PhD 73), is currently at Metropolitan State College in Denver, Colorado. She was recently promoted to Associate Vice-President of Student Affairs.

SOBOL, JOHN A (MA 49), is at the Department of Geography, Memphis State University, Tennessee.

SOLOMON, LES (PhD 74), is College Curriculum Support Project Coordinator with the Bureau of the Census. He is associate author of an undergraduate textbook, Census 80: Continuing the Factfinder Tradition. He recently published "Data Bases in the Humanities

and Social Sciences" in Journal of Geography in Higher Education. He is presently completing development of a workbook of classroom exercises on the use of census data.

SPECHT, RAYMOND E. (MA 47), is University Planner at the University of Wisconsin in Stevens Point. He is co-author of The Wisconsin Valley Line and author of Central Wisconsin Railroads: Past and Future.

STERNBERG, ROLF (MA 56), is Associate Professor at Montclair State College. He is author of "Hydroelectric Energy in the Context of Brazilian Urban and Industrial Planning" in Latin America, Pacesetter volume. He has a continuing interest in hydroelectric projects and Environmental Modifications.

VOURAS, PAUL P. (MA 51), is Professor of Geography at William Paterson College in New Jersey. He has conducted research on the depopulation of the Greek Mountain Villages and is interested in the impact of the common market on Greek agriculture.

VAN TUYL, H.E., JR. (1954-55), lives now in Arlington, Virginia.

VAN WINKLE, KEITH (MA 70), is President of VAN WINKLE CUSTOM ENTERPRISES, Inc. and President of the Upper Valley School of Gymnastics, Inc.

VARNEY, CHARLES B. (AM 53, PhD. 63), is Professor of Geography at the University of Wisconsin - White-water. This year he conducted a study tour of The People's Republic of China.

WALLACE, LILLIAN H. (AM 41), is retired and living in Westfield, Massachusetts.

WARMAN, HENRY J. (PhD 45), is retired and living in Worcester. He enjoys fishing and his summer cottage.

YOUNG, FLORENCE W. (1938-1940), is retired and living in Rutland, Massachusetts.

IN MEMORIAM

SEYMOUR I. WEST (MA 41), died September 3, 1979.