A RESEARCH REPORT ON DEVELOPING A COMMUNITY LEVEL NATURAL RESOURCE INVENTORY SYSTEM

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PREFACE

The Center for Studies in Food Self-Sufficiency was formally instituted in the Fall of 1974 as a community-action/research project of the Vermont Institute of Community Involvement. The Center has begun a long-term effort into energy, food, man and environment relationships. During its first year, the focus of research has been on the use of energy in present agricultural production in Vermont and on a study of feasibility for increasing food self-sufficiency (local production to meet local needs) in Vermont. While the Center is currently working toward a plan for increasing Vermont's self-sufficiency and diversifying agriculture within the state, work is directed toward the development of a methodology for examination of similar questions anywhere in the world.

The energy crisis has clearly revealed that the national production/distribution system for all goods is based on incorrect assumptions concerning the finite nature of natural resources. One possible way to deal with resource related crises is the development of regional, ecologically sound, self-sufficient production/distribution models. It is our hope that this report, along with others to be released, will contribute to a discussion and the development of policy that better utilizes our natural resources in the production of food.

ACKNOWLEDGEMENTS

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I. INTRODUCTION

Many people recognize the inevitability of growth and change and have looked for a means to exercise some control over the future of their town, region, and state. Land use planning is an attempt to influence growth and create some degree of citizen control. Despite a great deal of public controversy, by 1977 there was a system of 13 regional and 238 local planning commissions operating in Vermont. Often, one of the first activities of a planning commission is to establish an information base for determining physical, topographic, and socio-economic characteristics of the area. Existing data are collected and new data are generated. Unfortunately, many well intentioned planning commissions fail to take full advantage of the information available to them. Both paid and volunteer planners are conscious of the amount of data which they feel should be considered in developing any plan or policy, but are frustrated by the lack of knowledge of cost effective methods for integrating the data. Most methodologies for comprehensive rural planning are sophisticated transplanted urban planning techniques which are not appropriate to rural situations. The object of this paper is to report on a planning tool developed specifically for rural areas--an information system--and its application in two pilot Vermont towns.

The problem can be stated as follows: how can data be organized, stored, combined, and selectively retrieved so that it can be effectively and efficiently used in specific analyses the planning commission wishes to perform? A computer based resource inventory system, SEURAT, has been developed by the Center to address this problem. SEURAT is a basic map overlay system designed to do the following:

-overlay and store mapped information

-print maps of any individual category or combination of categories

-determine acreage of any category or combination of categories

It is an information manipulation tool which can be only as accurate as the least accurate information retrieved, and only effectively used by those who understand its limitations. By selectively combining and printing maps of different pieces of information, the system can save the planner many hours of light table and planimeter work. However, it must be kept in mind that the system cannot make decisions. The information which is not entered into the system (such as moral values, political feasibility, etc.) is probably more important to a decision than all the information which is entered into the system.

With these caveats clearly stated, we will list several example questions posed by regional or town planning commissions, for which SEURAT information maps were printed.

-How much land has gone out of agricultural production in the past 30 years, and what is the land presently used for?

-Where are our "prime" soils and what is the land use on these soils?

-How much of our present agricultural land is presently zoned for agriculture? How much of our present agricultural land is zoned for commercial/industrial/or high density residential use?

-How much of our present agricultural land would be zoned for agriculture under each of several proposed zoning ordinances?

The system can be most useful at the following stages of the planning process:

- reviewing trends
- retrieving and presenting information to be used in plan or policy development
- reviewing adequacy or suitability of plans, policies or ordinances which are in effect
- comparing adequacy or suitability of different proposals for new plans or ordinances

Overlay systems similar to SEURAT have been used in planning for at least 55 years. (1) The logic is simple--when decisions involve an analysis of two or more characteristics (such as soils, slope, and land use), maps of each characteristic are drawn to the same scale and overlaid. The viewer can then see where specific favorable or unfavorable combinations occur (such as flat areas with deep soils or areas with steep slopes and erodible soils).

This method of overlaying probably owes its fame to Iam McHarg whose overlay analysis technique has been demonstrated in Design with Nature.(2) The method is based on the ranking of natural and social characteristics in terms of value, cost or severity of impact. For example, in a highway study, critical physiographic factors are ranked according to the increase in construction cost which they would cause, and mapped so that the darker the tone, the higher the cost. Similarly, other factors such as wildlife, recreation, residential, historic, scenic, and forest values are mapped so that the lighter the tone, the lower the cost. Each factor map is produced as a transparency with three ranked categories. When several transparencies are overlaid, the resulting composite shows areas of highest social cost in dark colors, and areas of least cost in light colors.

This method is simple and easily understood. However, a composite map can become very difficult to interpret when the variables to be considered are so numerous that the entire map appears muddy brown. The consequent use of a spectrophotometer to detect differences detracts from the inherent simplicity and credibility of the method. In addition, the transparencies created tend to be useful in answering only one question and must be redrawn for additional analyses. For example, southern aspect may be least cost (light tone) for a solar building but highest cost (dark tone) for a forest or a ski slope.

The hand-drawn data file method, explained by Steinitz, Parker and Jordan,(3) solves some of these problems. While McHarg would print one transparency with three tones representing three categories of cost due to aspect, for example, the data file method would require three separate maps--one for each category of cost due to aspect. Each of these maps would then be reproduced in several colors so that northern aspect could be used in one analysis as least cost (green) and in another analysis as highest cost (red). In addition, putting two red transparencies of northern aspect into a composite overlay has the effect of weighting--the cost of northern aspect will now appear to be twice as high in the composite map.

Although this method is considerably more flexible than the previous overlay systems, redrawing and reclassification will often be necessary. For example, consider soil as the factor. At the present time, several definitions of "prime" agricultural soils have been proposed. Using the hand-drawn method, each new definition necessitates hand producing a new map.

Hand-drawn overlay maps have been used primarily to indicate areas of relative suitability. The mixture of tones and colors produces a pattern of light and dark which, when scrutinized, may suggest alternative solutions. The same overlay method could be even more useful if, in addition, a composite map could be produced which showed only the areas which met certain specified criteria, and if the acreage of areas meeting these criteria could be calculated. This would allow easier comparisons and tabulations.

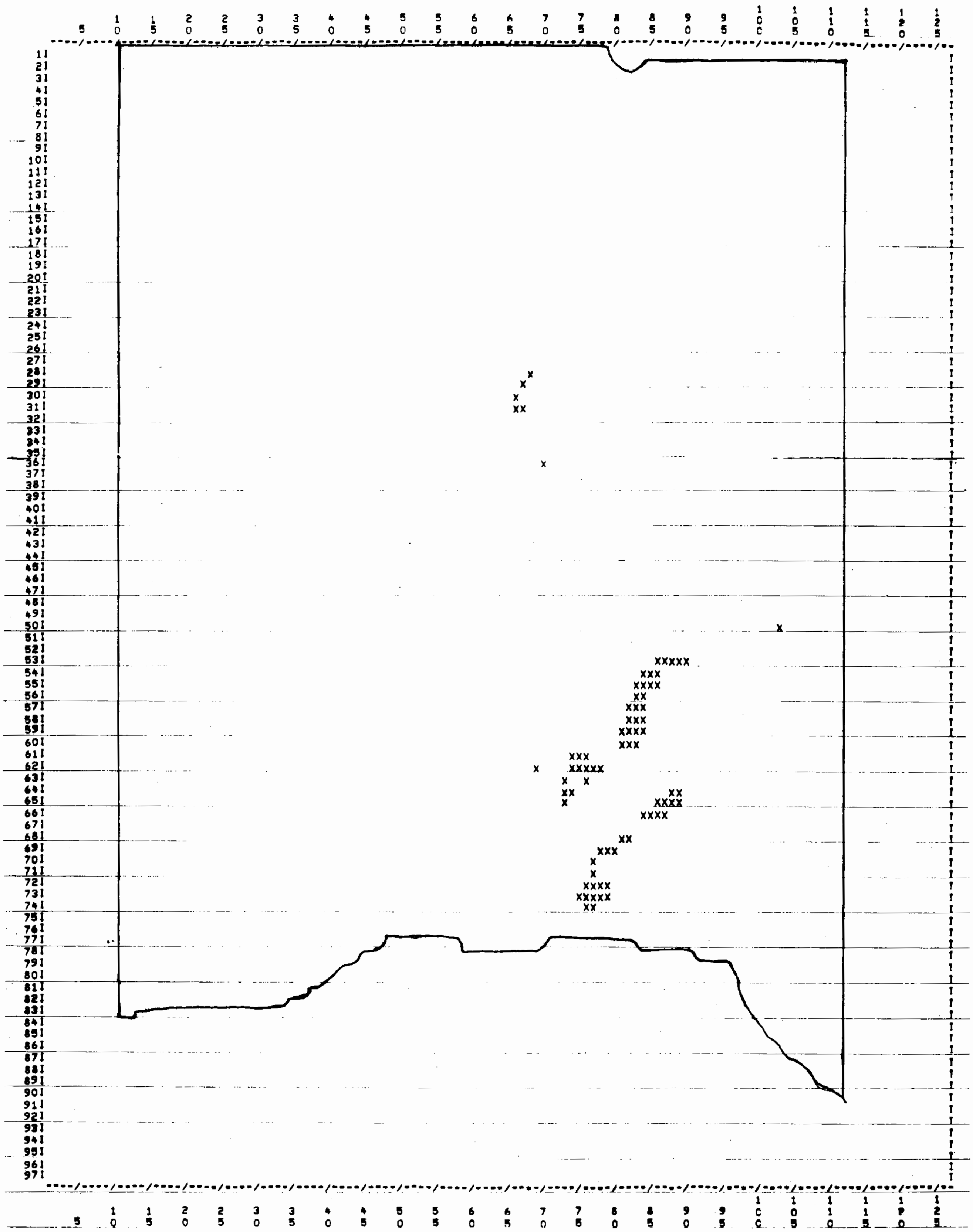
Use of a computer in the overlay process increases the flexibility of the method. Data are essentially stored by a data file method. That is, any factor category can be accessed independently of the others, and there can be many more than three categories without producing muddy maps. To use the prime agricultural soil example, once the basic soils map is entered into the file (whether by soil types, or individual characteristics such as depth to bedrock, etc.) the soil units can be aggregated according to any definition of "prime" without remapping. A different definition of "prime" requires only typing in different numbers to produce the new map.

Another advantage of the computer data file method is that the output can be adapted to the specific analysis needs. The map can be printed in different shades of grey to indicate relative suitability classes, as in the hand-drawn method, or a map can be printed showing only those areas which have prime agricultural soils which are currently in agricultural use. Thus, the user can specify the particular categories to be printed in order to reduce the amount of information on the map. (See figure 1)

In addition, the computer overlay system can count cells and calculate the area of each of the categories printed on the map. SEURAT merely adds flexibility, composite map editing, and counting capabilities to the commonly used overlay method.

FIGURE 1

Highest Potential* Agricultural Soils in Agricultural Use



*See Appendix.

VI. CONCLUSION

The ability to control and shape the environment exists most powerfully at the local level. Local people are the most intimately involved with environmental and land use issues. They are the ones who must live most directly with the consequences of planning decisions.

Therefore, it makes good sense that local people should have access to planning tools and inventory systems such as the ones described in this report. As we have stated, there is no 'best' system, only a best system for a particular community's needs and resources. State and regional planning groups have a major role to play in aiding communities select, set-up, and maintain computerized or non-computerized inventory systems which fit the individual community.

This project has been an attempt to show, in an exploratory fashion, what some of the capabilities and outcomes can be for Vermont communities which use computer techniques for natural resource inventory systems.

It has been a continuation of the Center for Studies in Food Self-Sufficiency's effort to carry out projects in the community--projects in which the community itself can directly participate and from which it can benefit.