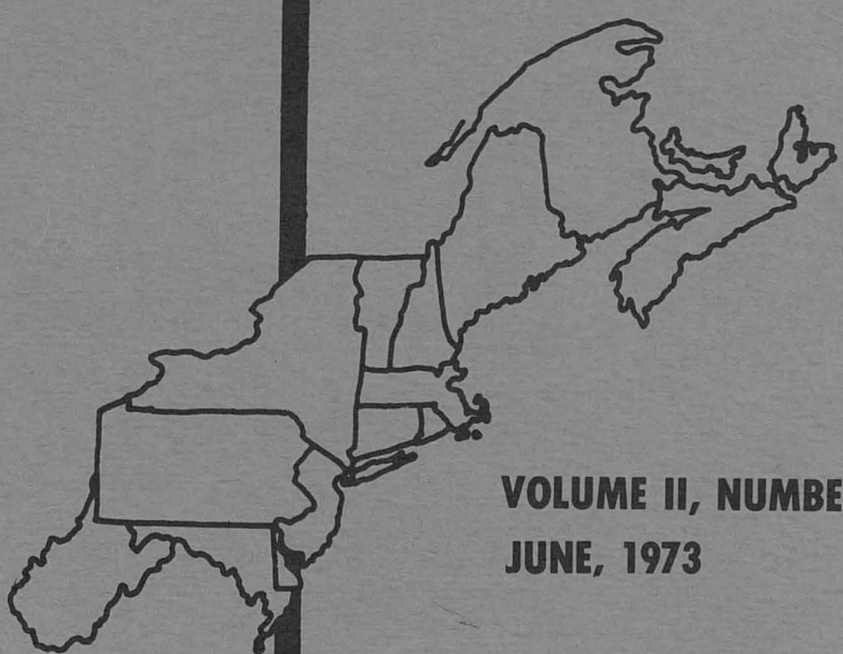
JOURNAL OF THE

Northeastern Agricultural Economics Council



VOLUME II, NUMBER I
JUNE, 1973

IDENTIFICATION AND MEASUREMENT OF MICRO-LAND USE INFLUENCES 1/

by

Bennett B. Foster
Associate Professor of Forest Resources

and

Frederick B. Courser
Graduate Research Assistant
Institute of Natural and Environmental Resources
University of New Hampshire

It is generally appreciated that characteristics and features such as mountains, forests, snow-fall, lakes, secondary road networks and major highway systems from population centers greatly influence the type of activities and uses which ultimately develop on lands in a particular region. It is not surprising for example, that up-state New York and central New England have developed into areas of year-round vacation and tourism, since the composite "bundles" of characteristics offered by these areas include many features appropriate and necessary for such use. These general characteristics could be termed "macro-land use influences". Once these macro-land use influences have attracted a certain type land use, however, the next question is: What specific characteristics influence the use of a specific acre or parcel of land? What are the "micro-land use influences"? Intuition would cause one to conclude that a parcel of land in the proximity of such things as a ski-slope, lake, exceptionally scenic area, access road or perhaps a vacation home, would be under strong pressure to be used for a vacation home also. Such characteristics, of course, would not be sufficient to determine land use, but they could certainly influence its ultimate use.

It would be of value in land use evaluation and planning if a method of identifying and quantifying these micro-land use influences were developed, for it would make it possible for communities and other

1/ This study was funded through the McIntire-Stennis Forest Research Act of 1962, and approved for publication by the Director of the New Hampshire Agricultural Experiment Station as Scientific Contribution No. 671.

planning groups to have more sensitive accounting and control of land use changes. Such a method was developed in connection with a land use projection study of an intensively used recreation area in central New Hampshire. The study was specifically aimed at quantifying the influences that three rather obvious characteristics had on the construction of vacation homes: 1) other inhabitable dwellings, 2) roads and 3) lakes. However, the approach used could easily be expanded to include many other characteristics that influence vacation home development, or those influencing other types of land use. This general method can be presented by way of the three specific characteristics, with suggestions how it might be expanded to include others.

Methodology

An accepted tool for studying land use change is the periodic aerial photo coverage which exists for many areas of the U.S. The aerial photo coverage of the Lakes Region of New Hampshire is a result of flights in 1954, 1964, and 1971, (17 years of coverage). Using one of the flights (1964) as a base, two randomly selected photo points were pricked on the first photo of each flight line, then repeated on alternating photos of the flight line, for a total of 752 points.2/ Each point was then precisely transferred to photos of the other two flights, and on appropriate U.S.G.S. quadrangle maps. Each point that "fell" on land (667 of them) was checked to determine which, if any of the three characteristics "influenced" it.

This influence determination was accomplished with the aid of a transparent plastic card on which concentric circles had been drawn in india ink, each with a predetermined radius in the scale of the photograph. The center point of the concentric circle overlay was placed over each photo point. If a segment or part of any road appeared within the "road-circle" the point was recorded as being influenced by a road, likewise by a house if within the "house-circle", and so forth (see Figure 1). What was accomplished can better be understood by envisioning that on each photograph, each inhabitable dwelling is at the center of a clearly defined "circle of influence" with a predetermined radius, each road is the center of a clearly defined "strip of influence" with a predetermined width, and each lake has a clearly defined "belt of influence" around it with a predetermined width. If a photo point fell within any of these "influence areas" it would be so recorded. In actual practice, however delineating these influential areas on photographs would be tedious and time consuming. The use of the concentric circles on overlay cards accomplishes the same thing with much less time and effort. It is somewhat of a portable modifi-

2/ This sampling technique is the standard method used in forestry for estimating timber volumes (Systematic Sampling with Random Start).

cation of the approach used by Wagner[1] in his study of land use around major highway interchanges in which development within one, two and three miles of such interchanges was measured.

In the New Hampshire Lakes Region study the influencing distances were set at 300 feet for roads, 600 feet for inhabitable dwellings and one mile for lakes.3/ Road classes were not differentiated, though this would be obviously logical in a more intensive study. Inhabitable dwellings were differentiated on grounds of density. If five or more fell within the house-circle the point was recorded as being influenced by "urban/built-up". If one to four houses, it was recorded as "settled rural". Lakes were differentiated by size; large lakes (1,000 acres or more surface area) and small lakes (100 to 999 acres surface area). Lakes or ponds of less than 100 acres of surface area were not considered. Again, it would be quite logical to further differentiate dwelling density or types, and lake size or quality in more intensive studies. The 300 and 600-foot circles for road and dwelling influences were easily read directly from the photographs. However, for the one mile lake influence it was less troublesome to apply an appropriate overlay circle to the sample points which had been transferred to quadrangle maps.

Some results of application

Some of the preliminary findings of the study do nothing more than verify what would logically be expected, while others offer some new insights into the hows, wheres and whys of vacation home development.

It is not surprising that the study shows a greater tendency for land, uninfluenced by roads or dwellings, to move into "settled rural" and "urban/built-up" categories when they are located within a mile of a lake, than when they are further away (see Table 1). It was of interest to the authors, however to find that in areas not influenced by a lake, the development pattern tended to follow the sequence: undeveloped --> roaded --> settled rural --> urban/built-up, whereas areas within one mile of a lake tended to move directly from undeveloped into the "urban/built-up" category. This most likely is a reflection of real estate developers constructing clusters of vacation homes on relatively expensive lakeside lands.

3/ It is recognized that such influencing distances are bound to vary with individual preference or judgement. These distances were used because, in the authors' judgement, they offered adequate descriptive indices for purposes of this study.

Table 1

The change in land influenced by one or more dwellings between 1954 and 1971, expressed in number of points and acre equivalence a/

Land Location re. 100+ Acre Lake	1954	1971	17-Year Change
Greater than 1 mile			
No. of points	81	99	22.2%
Acre equivalence	91,409 A.	111,722 A.	20,313 A. (1,195 A./yr)
Within 1 mile			
No. of points	58	81	39.7%
Acre equivalence	65,453 A.	91,409 A.	25,956 A. (1,527 A./yr)
All Land			
No. of points	139	180	29.5%
Acre equivalence	156,862 A.	203,131 A.	46,269 A. (2,722 A./yr)

a/ Total land area in Lakes Region = 752,715 Acres
Total number of land points = 667
One land point is equivalent to 1128.5 Acres

Conclusions

The usual land use trend analysis is based entirely on historic changes, and any future predictions are generally based on the assumption that unknown influences acting in the past will continue in the future, that is, past trends will continue in the future. If the specific features or characteristics of land that influence what a particular piece of land is used for could be identified and quantified, regional planners, land managers and others of similar interest would have another effective tool for their trade.

Regional planners, for example, would be able to foresee the areas which have a high probability of requiring water, electricity, waste disposal and similar services in the future. With the aid of topographic and soils maps, planners can locate where improvements such as roads and housing should be located. But these maps show static features. Air photos will show planners where the actual development has taken place in the past, and will denote the rate of development within the region.

In addition, as newer air photography becomes available, information may be updated and development trend projections revised. A combination of information would help to pinpoint such problems as potential groundwater pollution before they become acute. As areas of conflict are designated, the photo interpretation could be intensified and other tools might be brought into play; such as ownership, taxation, or economic studies.

Wildland managers, whether concerned with timber production or environmental despoilment, working in sparsely populated regions need a sensing device that would locate areas of potential land use conflict before the conflict actually developed. The approach, basically framed and tested in this study, is offered by the authors as a possibility of such a tool.

Figure 1 Explanation

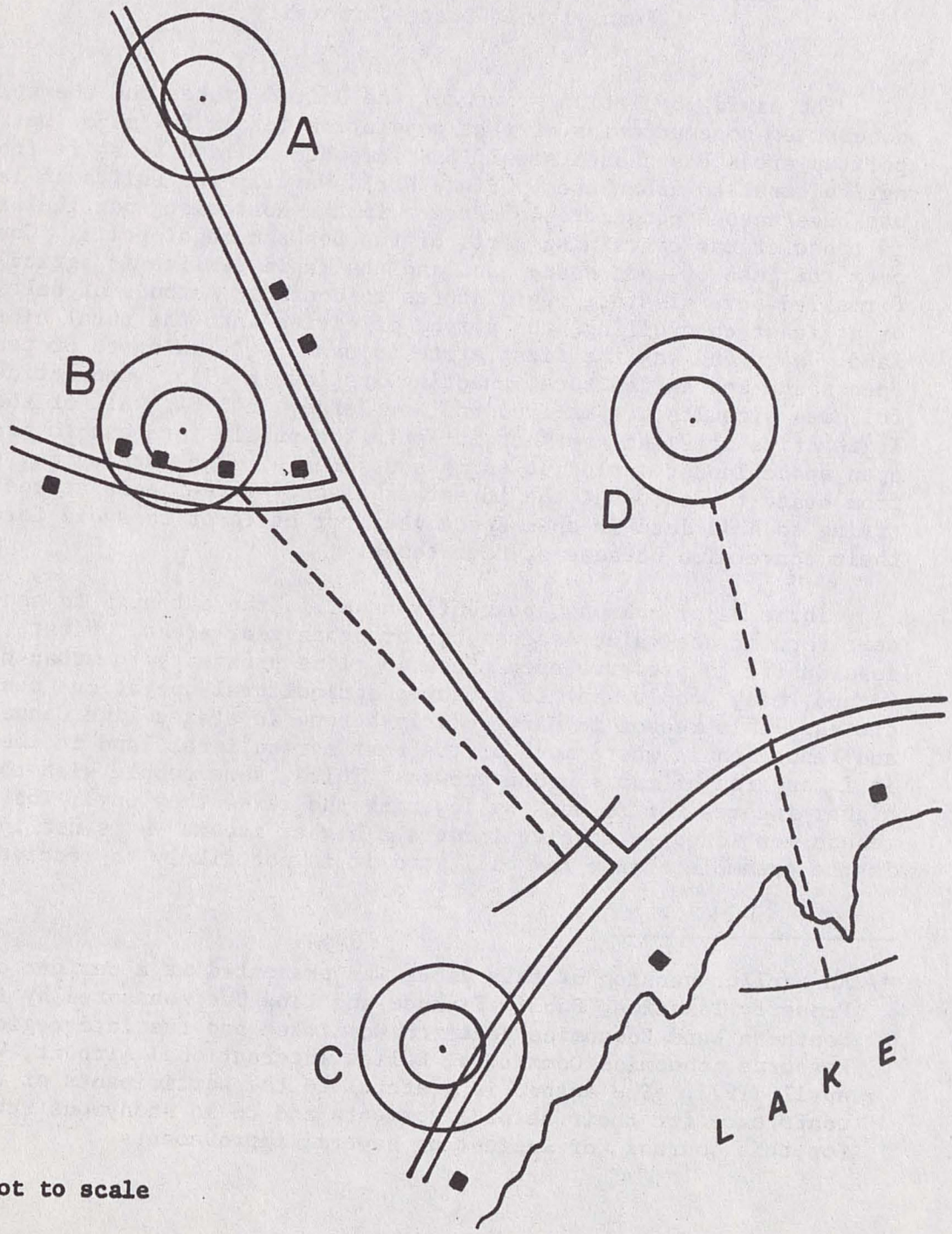
Of the four sampled points in figure 1: points A and C are influenced by a road within the (inner) road-circle, point B is influenced by three dwellings within the (second) house-circle. Point D is uninfluenced by either roads or dwellings, however it is influenced by the proximity of the lake (outer circle), as is point C. Neither point A nor B is influenced by the lake.

If this hypothetical situation were interpreted in light of the preliminary findings of the New Hampshire Lakes Region Study, it could be said that point D has a higher probability of being intensively developed in the future by five or more vacation homes, than point C has of being developed by even a single vacation home. This higher probability also holds true for point A. The most logical explanation for this is the landowners (or speculators) located along the road passing near point C are more apt to use their road frontage for access to their interior holdings where clusters of many homes could be built, than using it directly for a few vacation homes.

---

[1] Wagner, R.R., 1963, "Using Airphotos to Measure Changes in Land Use Around Highway Interchanges", Photogrammetric Engineering, 29(4):645-649.

Figure 1 Example of Sample Points



Not to scale