

THE EFFECT OF LAND USE ON THE NOCTURNAL  
HEAT ISLAND OF MACOMB, ILLINOIS

The objectives of this study were to establish the summer nocturnal heat island pattern within Macomb, and to statistically determine what part of the temperature variations can be explained by the spatial variations of the different types of land use. The temperatures found in the city were considered

By

Edward T. Gorny

Automobile traverses were used as the means of collecting the temperature data. The instrumentation used was an electronic thermometer with a thermistor probe mounted in a subsurface at a height of 1.5 meters. The land-use data was collected from a survey of Macomb's land use and

An Abstract of a Thesis

Presented to the Department

of Geography of Western Illinois University

in Partial Fulfillment of the Requirements for the

Degree of Master of Arts

Macomb, Illinois

March 20, 1975

MAP  
QC  
981  
.7  
.47  
G67  
C.2

#### ABSTRACT

The objectives of this study were to establish the summer nocturnal heat island pattern within Macomb, and to statistically determine what part of the temperature variations can be explained by the spatial variations of the different types of land use. The temperatures found in the city were considered to be the results of a number of land-use variables which were used to describe the urban surface of Macomb.

Automobile traverses were used as the means of collecting the temperature data. The instrumentation used was an electronic thermometer with a thermistor probe mounted to an automobile at a height of two meters. The land-use data was collected from a survey of Macomb's land use and USDA air photos of Macomb. The land-use variables used were: light and heavy industry, multiple and single-family residence, commercial-public, undeveloped areas and paved surfaces. The air photos and land-use maps were overlaid by a 1200 foot grid system and the percentage of each land use was recorded for each grid square. A temperature value was obtained for the center of each square by visual interpolation. To determine the dependence of the temperature variations within Macomb on various land-use factors, a multiple stepwise regression was used.

The general isotherm pattern was found to be similar in shape to the structure of the built-up area in Macomb. The warmest areas of the heat island was located in the center of the city where the building density and the amount of paved surfaces is the highest. Warm cells were also found in the manufacturing and commercial-public areas of

Macomb. Topographic variations in the city are relatively small but this factor still caused substantial temperature variations in the city.

In the first multiple regression, only the variables concerned with the building structure were found significant. In studying the residuals, elevation seemed to have a strong influence and another regression was runned with elevation as an additional variable. In this regression, elevation and building structure explained over 80 per cent of the variation in the temperature pattern. Evidence was presented both visually and statistically in this study which substantiates the hypothesis that man-made land uses largely determine the spatial pattern of the Macomb heat island during the summer.

APPROVAL STATEMENT

*William J. ...*

*M...*

*John J. ...*