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STATE OF ILLINOIS
DEPARTMENT OF ENERGY AND NATURAL RESOURCES

Atlas of Crop Yield and Summer Weather Patterns, 1931-1975

by STANLEY A. CHANGNON, JR.

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Introduction

A major phase of the weather-climate research of the Illinois State Water Survey for the past 20 years has concerned the relationships between weather and climate variables and crop production in Illinois (Changnon and Neill, 1967, 1968). Development of expertise in the area of weather-crop modeling, coupled with research interests in the long-range prediction of weather and crop yields, led to a 3-year research project (Huff and Neill, 1980). This project investigated statistical techniques of predicting future corn and soybean yields, for the 45 crop reporting districts found in the 5-state Corn Belt area of Illinois, Indiana, Iowa, Missouri, and Ohio.

One of the by-products of this project, which involved the computerization of the monthly climate data (temperatures and precipitation) and crop yield data, was a classification of these district data into one of three class intervals or terciles: above normal, near normal, and below normal. Corn Belt maps based on these three classes of yields and summer weather variables were then prepared. This report presents selected cartographic results for each year in the 1931-1975 period of study. These patterns are revealing, in a general way, of many important features of crop yield variability, in space and time, and the inherent relationships between July and August weather conditions.

For each year one finds the following material, as classed in the three intervals (above normal, near normal, and below normal), for corn yields,

soybean yields (1944-1975 only), July rainfall, July temperature, August rainfall, and August temperature. Production of soybeans across the 5-state area was relatively minor prior to 1944, hence only the results for 1944-1975 for soybeans were used.

The three classifications of above normal, near normal, and below normal relate to the division of the 45-year values of each district into three equal intervals. Thus, the above normal class has the highest 15 yearly values in it. The corn and soybean yield values, before classification into the three intervals, were assessed on the basis of changing technology. That is, a curve was fitted to the yield values from 1931 to 1975 to handle the ever-increasing trend in yields due to technological and/or other improvements. Then each of the 45 yield values was classed according to its departure around the trend line.

The maps are presented in pairs for various yields and weather conditions. Thus, those relating to 1931 and 1932 are presented first, then those for 1933-1934, 1935-1936, etc.

Findings

There are many approaches for examining the statistical presentations of the 45 districts, particularly as they relate to temporal variability. Huff and Neill (1980) present a variety of statistical information on the space and time relationships, across the Corn Belt, for both corn and soybean yields, as well as for summer rainfall variables.

This atlas, however, allows the reader to inspect these data in a general sense. One can derive a series of qualitative impressions of value. The reader is encouraged to examine the temporal differences in yield patterns across the Corn Belt over time, and also to look within given years at the

regional variations in yield and weather variables. In particular the reader should note the general relationships between precipitation and temperature and the yield patterns. Note the widespread hot and dry July conditions in 1933, 1934, 1935, and 1936 and the bad corn yields. Then note the widespread cool and wet conditions in 1963, 1965, 1967, and 1969 and the high yields with these conditions. These show the strong control of the July and August weather variables on the crop yields. Inspection reveals the greater weather control in the western half of the Corn Belt than in the northern and eastern portions of Ohio, northern Illinois, and northern Indiana.

On a temporal basis, the reader is encouraged to compare the corn yield patterns of the 1930's with those of the 1960's and 1970's. There are frequent years with widespread below normal yields in the 1930's and 1940's, and then frequent widespread above normal yields during many years in the 1960's and 1970's. Widespread above normal corn yields occurred in 1939, 1942, 1946, 1948, 1963, 1965, 1967, 1969, 1971, and 1972; widespread below normal corn yields existed in 1933, 1934, 1935, 1936, 1944, 1947, 1951, 1953, 1954, 1955, 1970, and 1974.

The 45-year sampling period includes some other interesting variations in runs of conditions. Note the many widespread cool Augusts during the 1961-1967 period.

In a similar vein, one should inspect the patterns of July rainfall and temperatures of the 1930's, 1940's, and 1950's, and then compare these with those of the 1960's and 1970's. In many respects, they reflect the corn yield maps, revealing the high frequency of generally good recent July weather (above normal precipitation and/or below normal temperatures in the 1960's and 1970's).

The reader is also encouraged to compare, in each year, the corn yield patterns across the Corn Belt with the four weather conditions. One notes, in particular, the control of July conditions on the corn yield patterns. The comparison of soybean yields reveals a lesser relationship, although bad August conditions are shown to be important (note 1944, 1953, 1955, and 1974).

These comparisons of temperature and rainfall also reveal the well known interaction between temperature and rainfall. That is, below normal rainfall often occurs with above normal temperatures, and vice versa.

Another important impression from the yield maps is that in more than half of the 45 years, one does not find widespread departures above or below, but a mixture. Mixed corn yields (some districts above, some below) occurred in 24 of the 45 years. Widespread high corn yields existed in 10 years, and widespread low yields in 11 years. This tendency to mixed (high and low) yields in half the years indicates that some favorable and some unfavorable weather existed in various parts of the Corn Belt in a given summer such that some areas were winning (above normal yields) and others were losing.

In 6 of the most recent 15 years (1961-1975) there were at least 23 of the 45 districts with above normal corn yields (and 1 year with below normal). This strong recent tendency for widespread above normal yields has interesting implications for the Corn Belt's economy. In the 1940's and 1950's one notes a greater distribution of yield extremes in several years (see 1940, 1945, 1950, 1952, 1955). In the 1930's one finds the reverse of the conditions in the 1960's and 1970's with many years with widespread below normal corn yields. The 1940's also had frequent extremes with widespread below normal yields in 1944 and 1947, and widespread above normal yields in 1942, 1946, and 1948.

Interpreting the Presentations

On each map, the classification labeled No. 1 (symbol = black dots) indicates a district with an area average value classed as below normal; that is, representing one of the 15 values that occurred in the lower third of the ranked distribution. The value shown as No. 2 (symbol = 0) represents a district with the value in the near normal category. The symbol coded No. 3 (symbol = solid black squares) indicates a case of above normal conditions, be they yields, temperatures, or rainfall.

The maps are presented in the following order for each 2 years starting with 1931 and 1932:

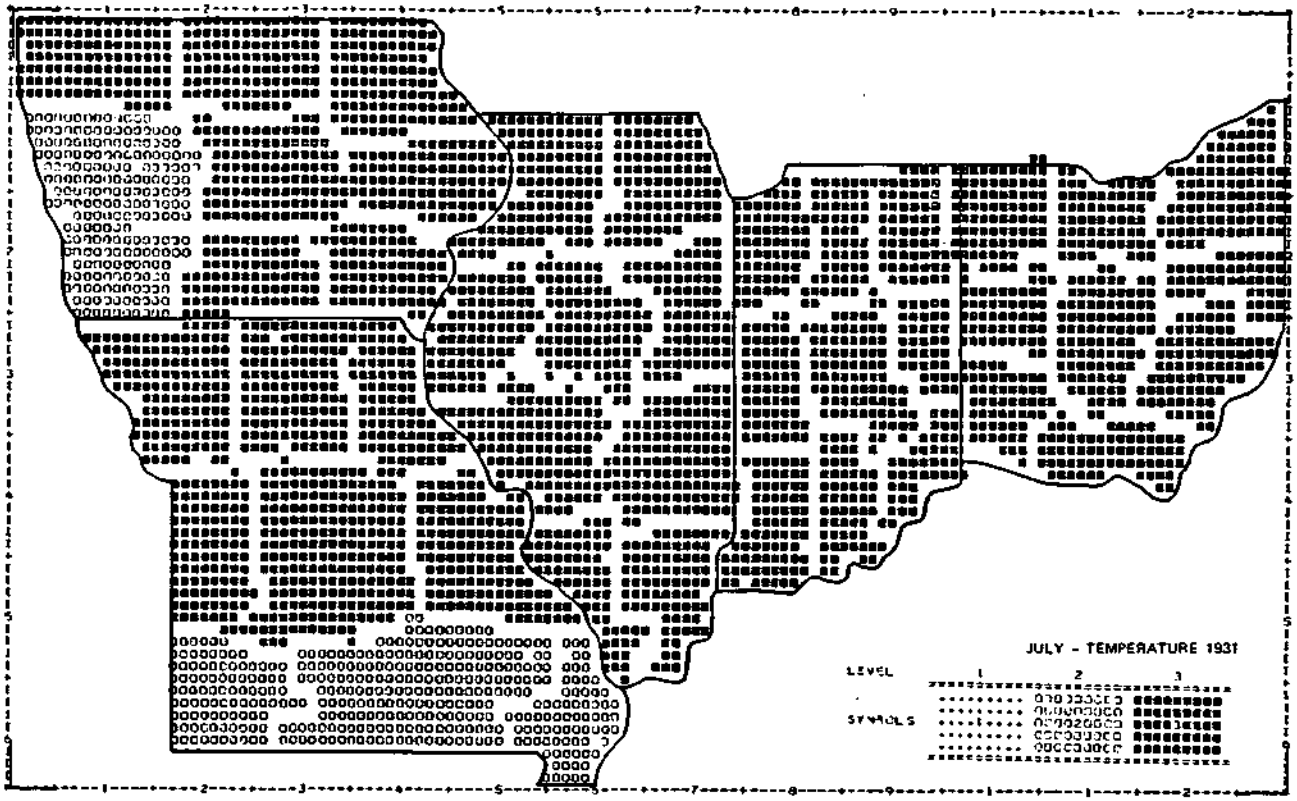
1) July temperature
2) August temperature
3) July rainfall
4) August rainfall
5) Corn yields
6) Soybean yields (starting 1944)

References

Changnon, S. A., and J. C. Neill, 1967: Areal Variations in Corn-Weather Relations in Illinois. Transactions Illinois State Academy of Science, 60, 221-230.

Changnon, S. A., and J. C. Neill, 1968: Mesoscale Study of Corn-Weather Response on Cash-Grain Farms. Journal of Applied Meteorology, 68, 94-104.

Huff, F. A., and J. C. Neill, 1980: Assessment of Effects and Predictability of Climate Fluctuations As Related to Agricultural Production. Final Report, Phase I, to Climate Dynamics Office, NSF Grant ATM76-11379, Illinois State Water Survey Contract Report 231, 118 pp.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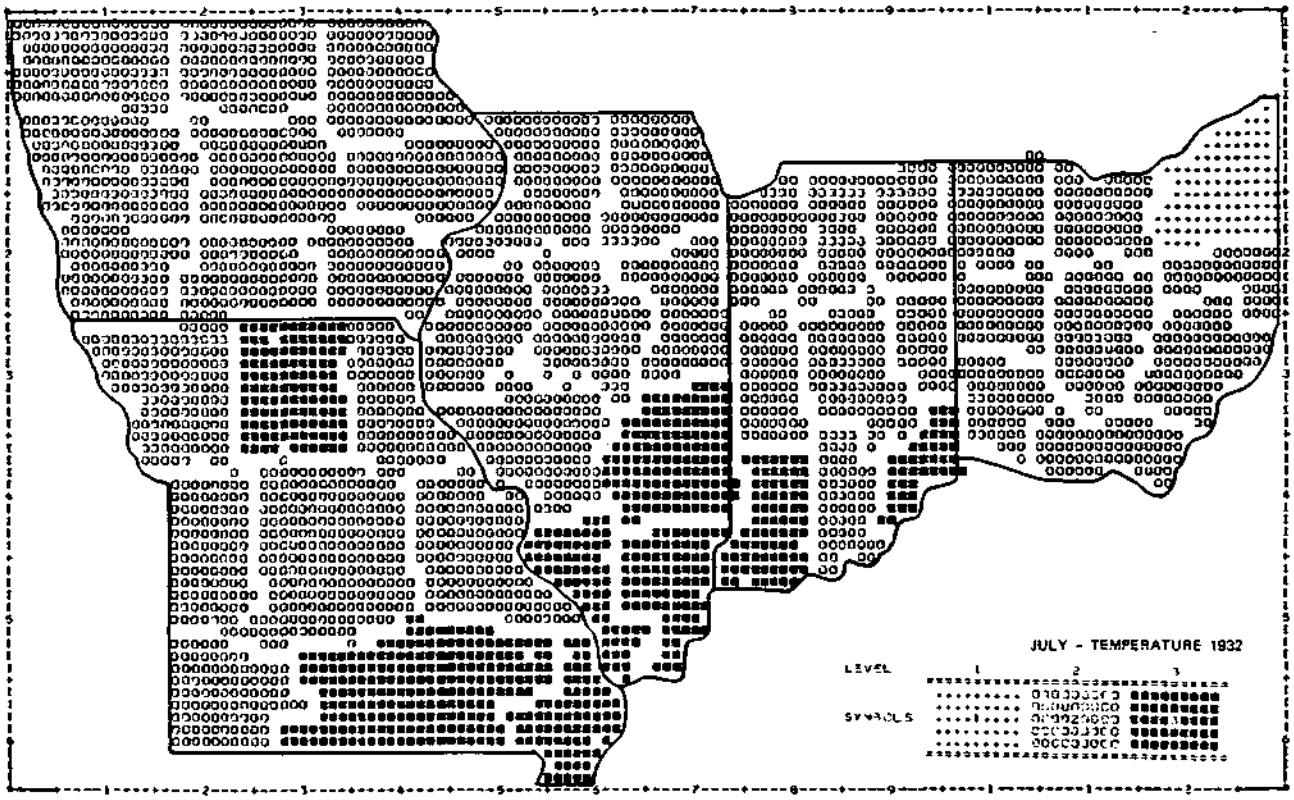
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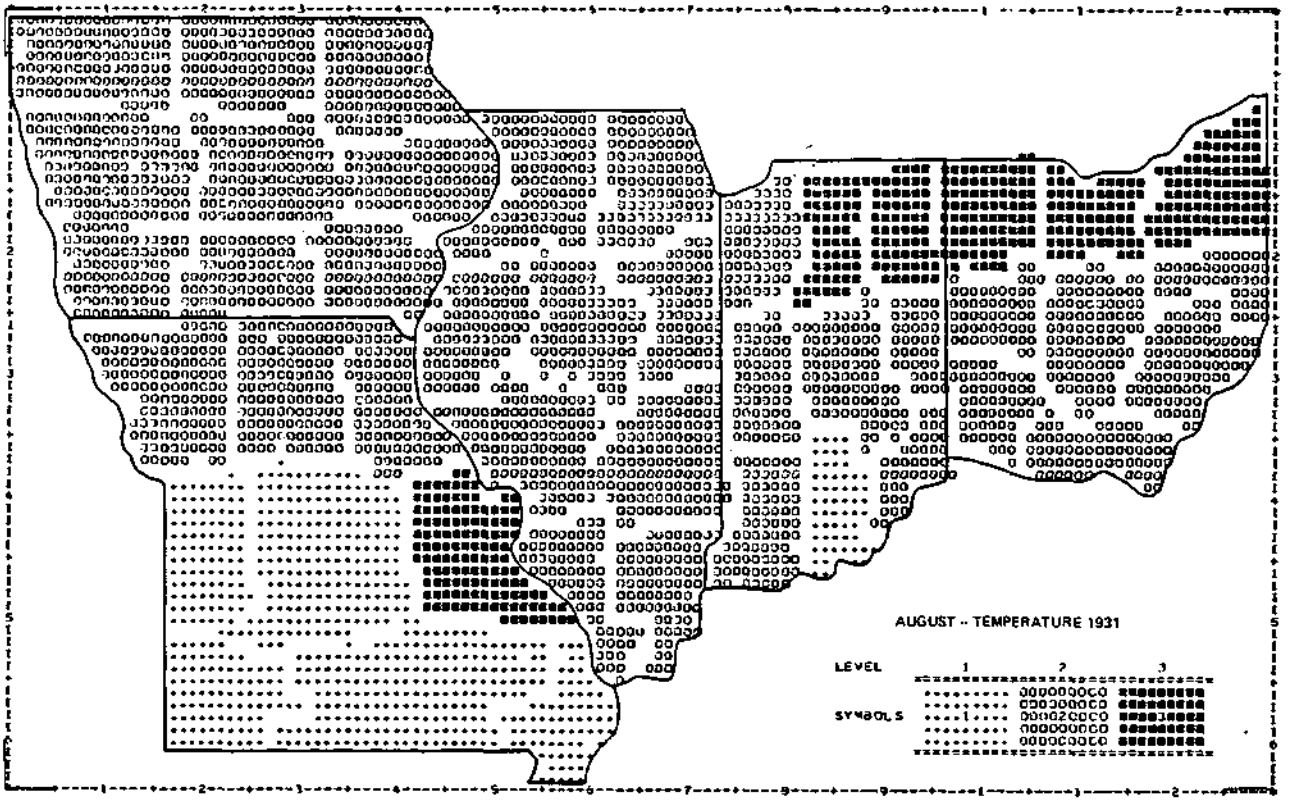
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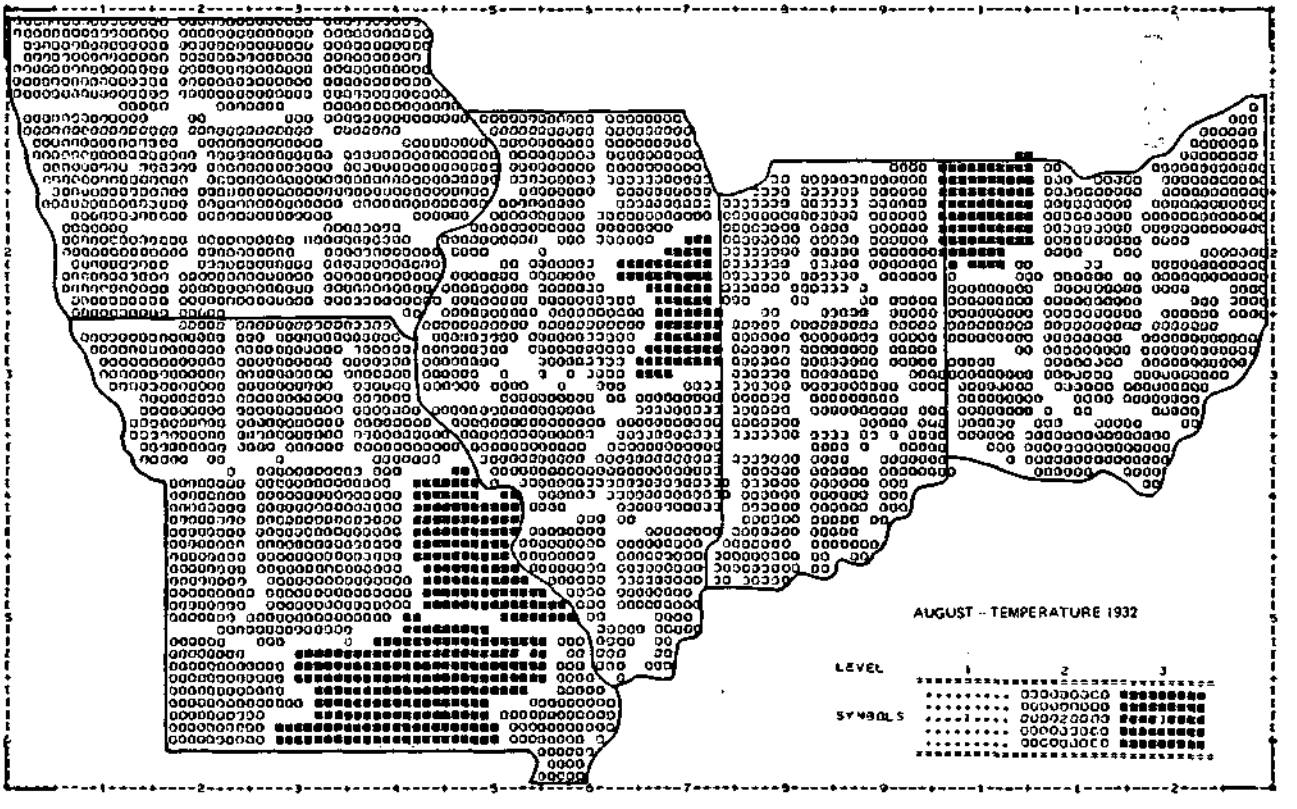
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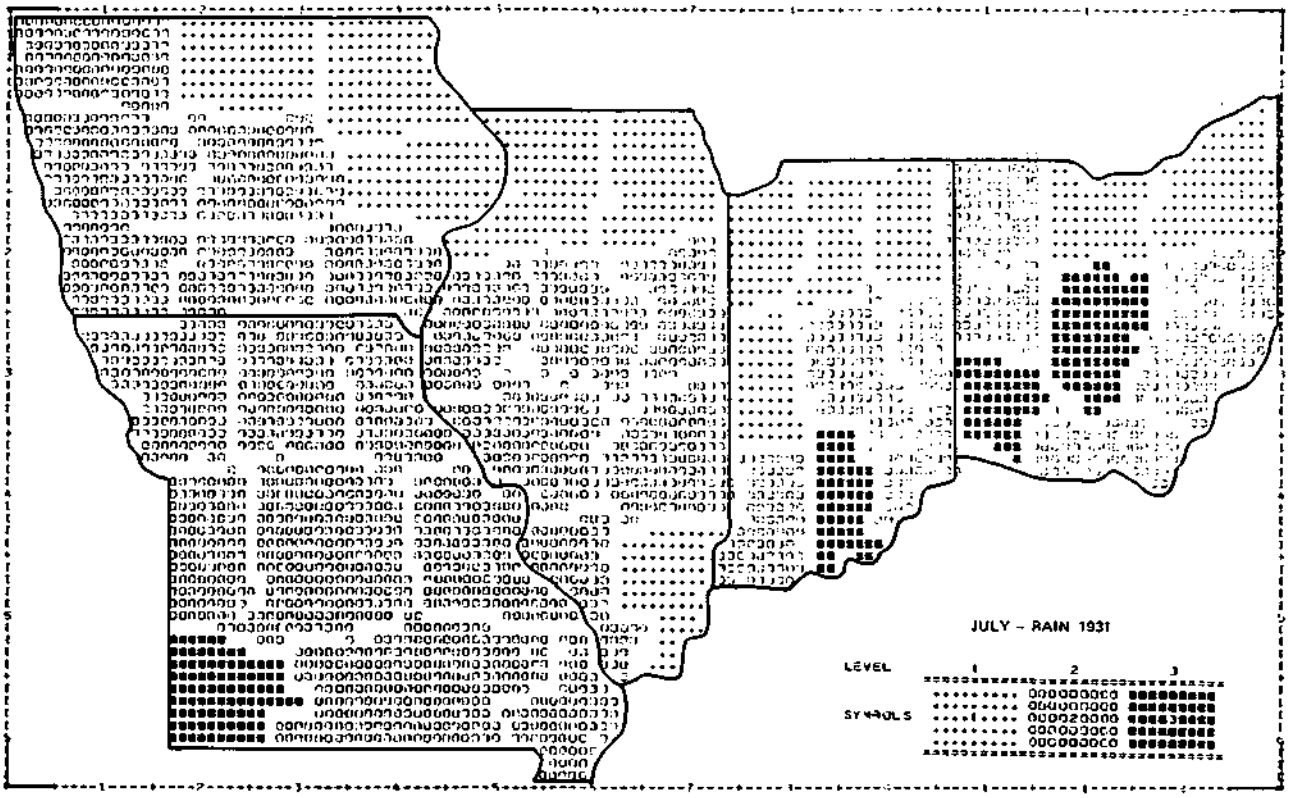
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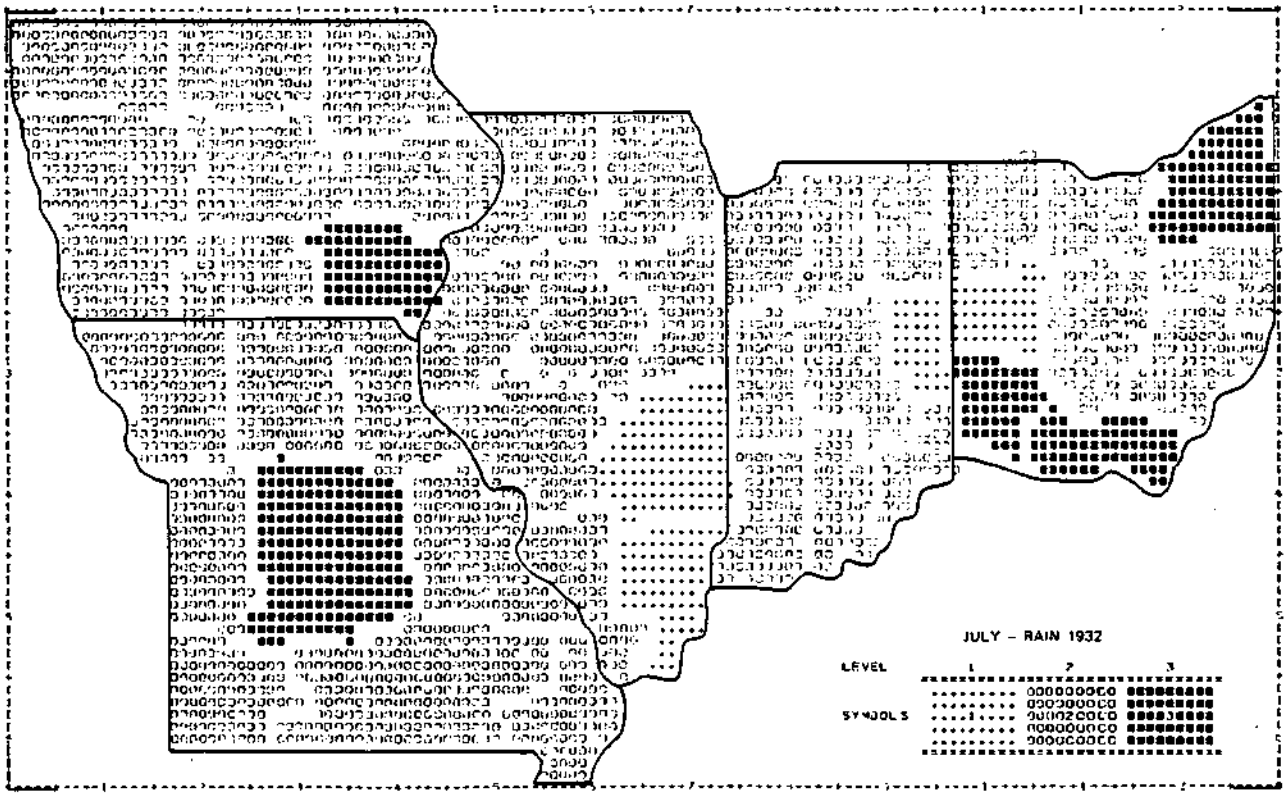
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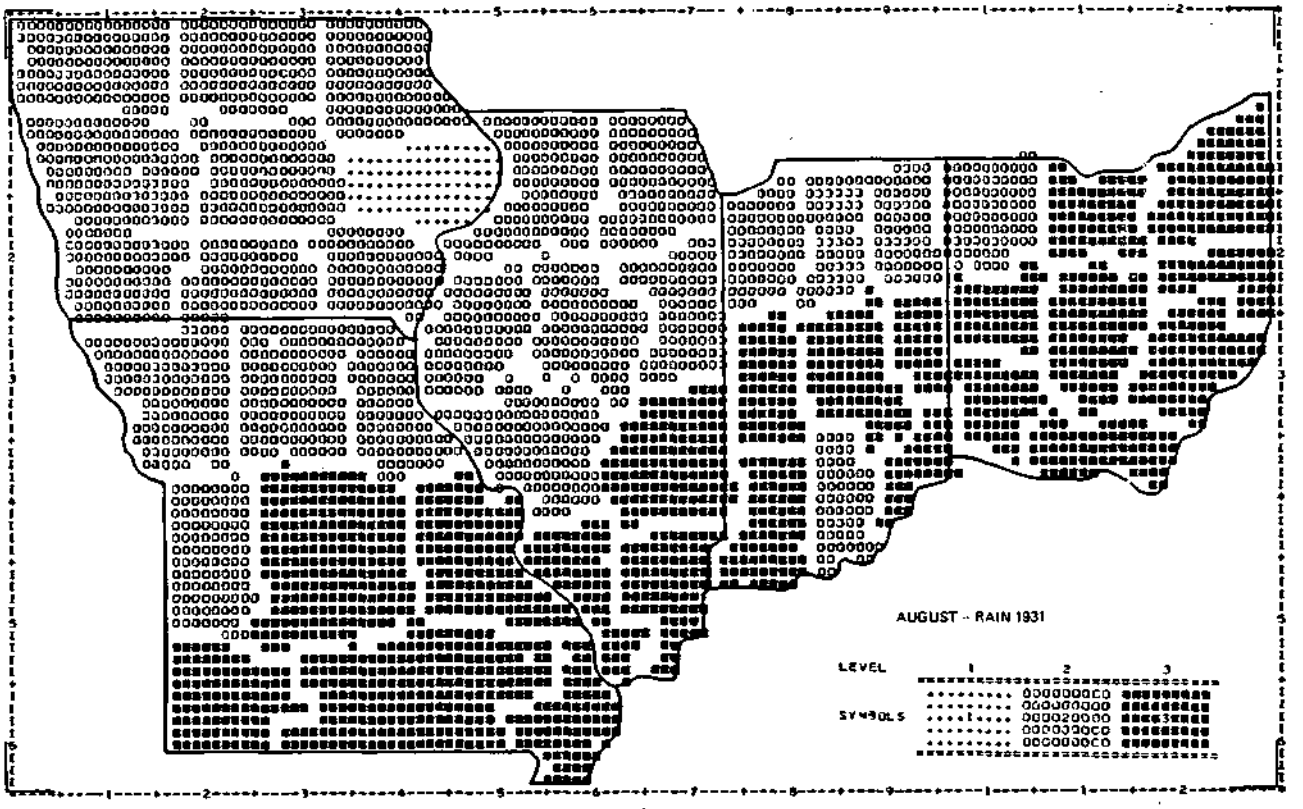
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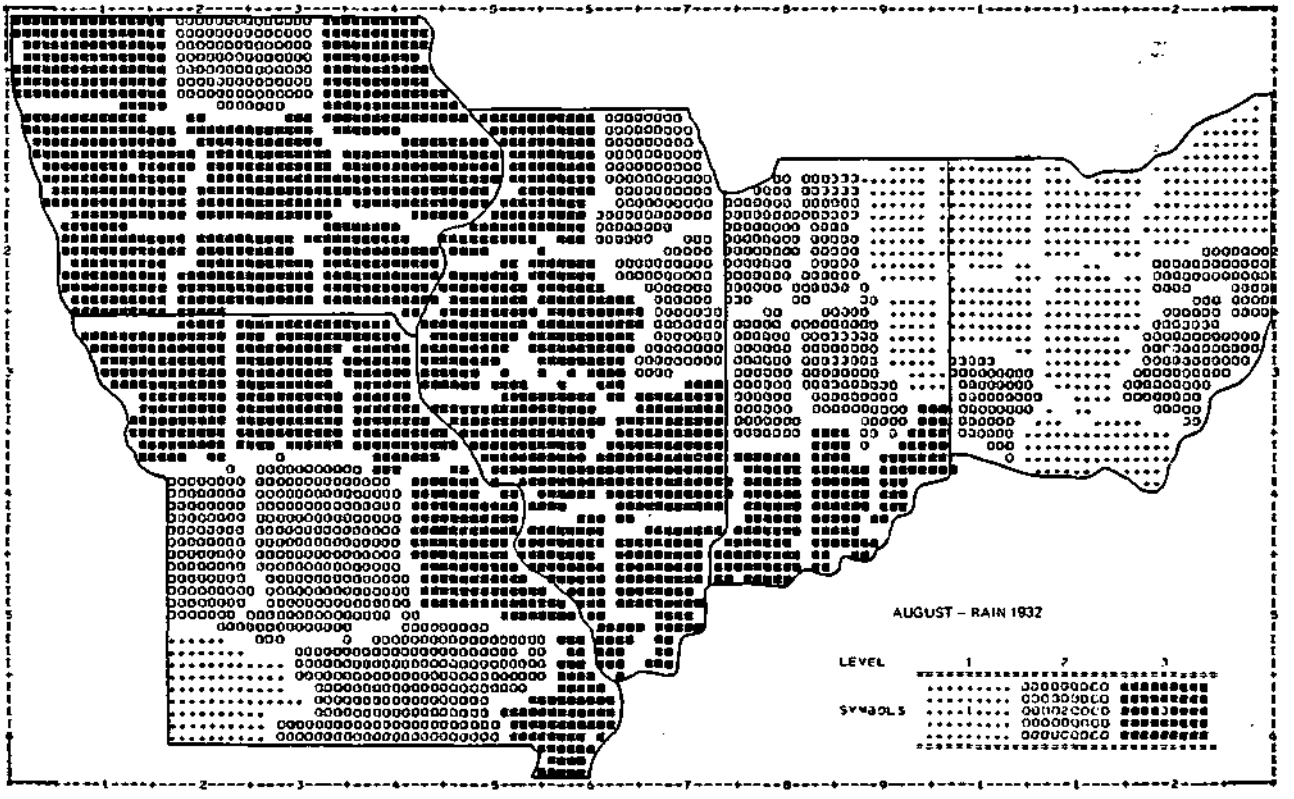
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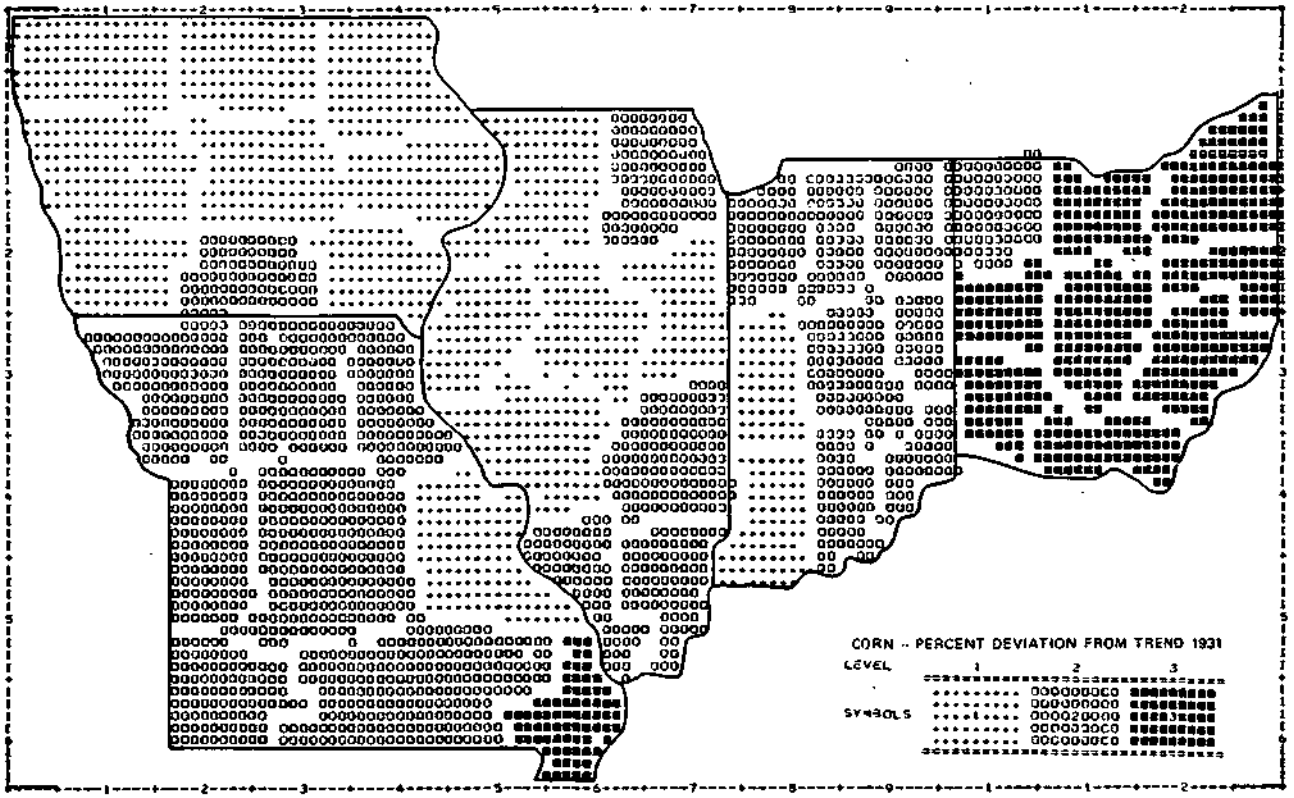
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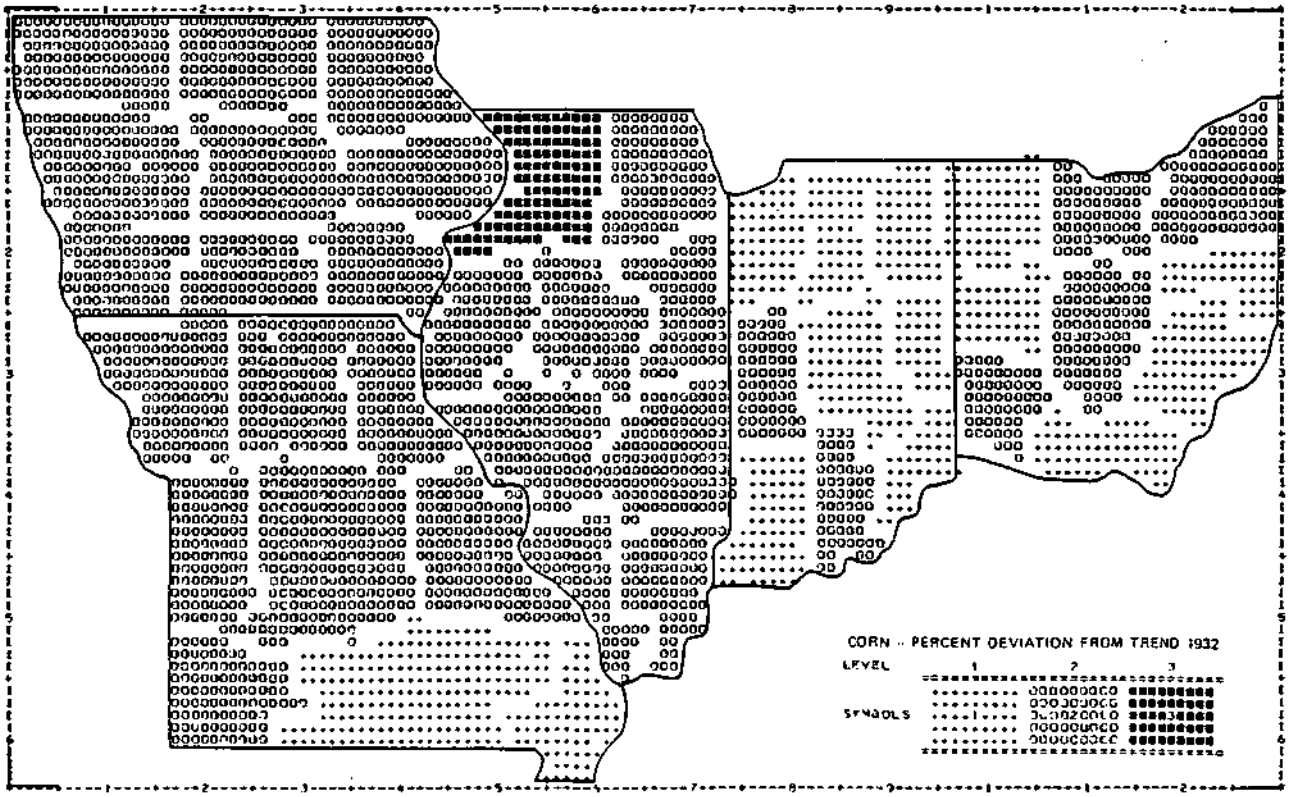
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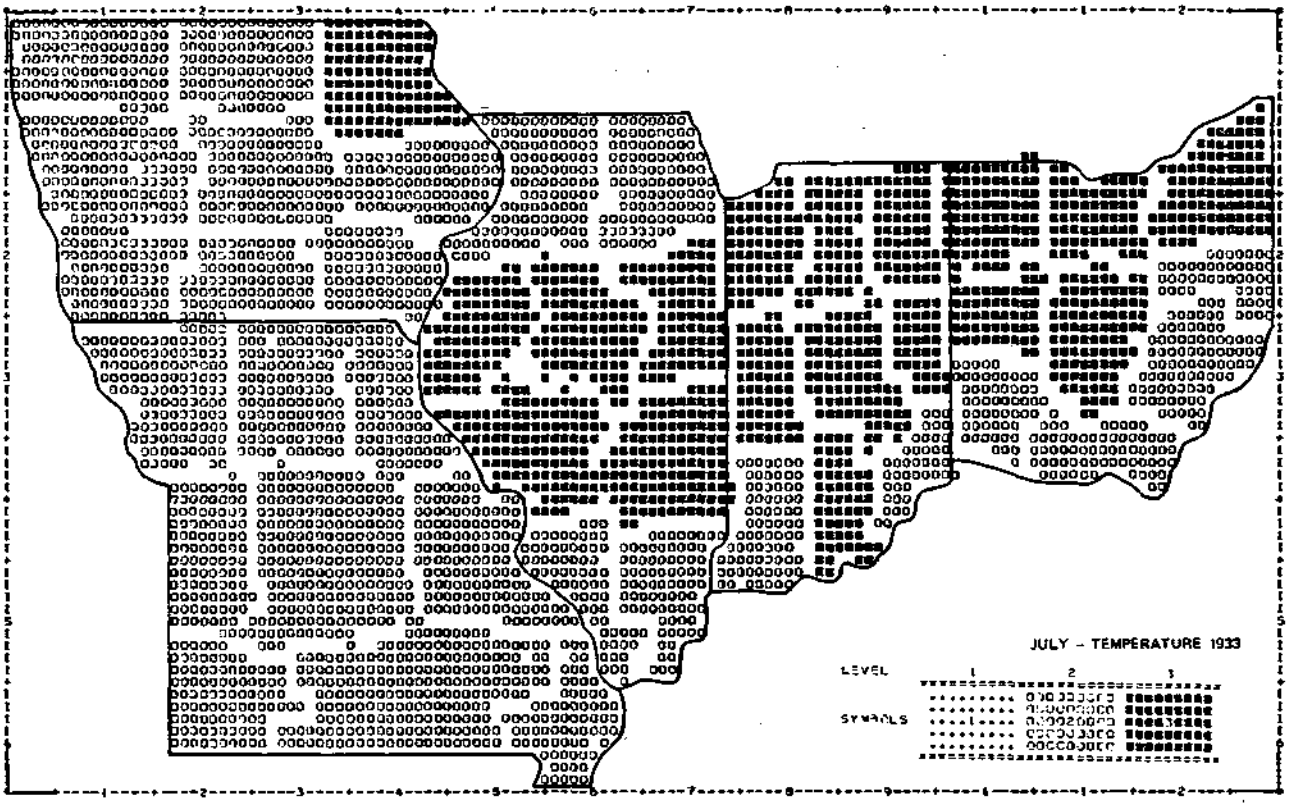
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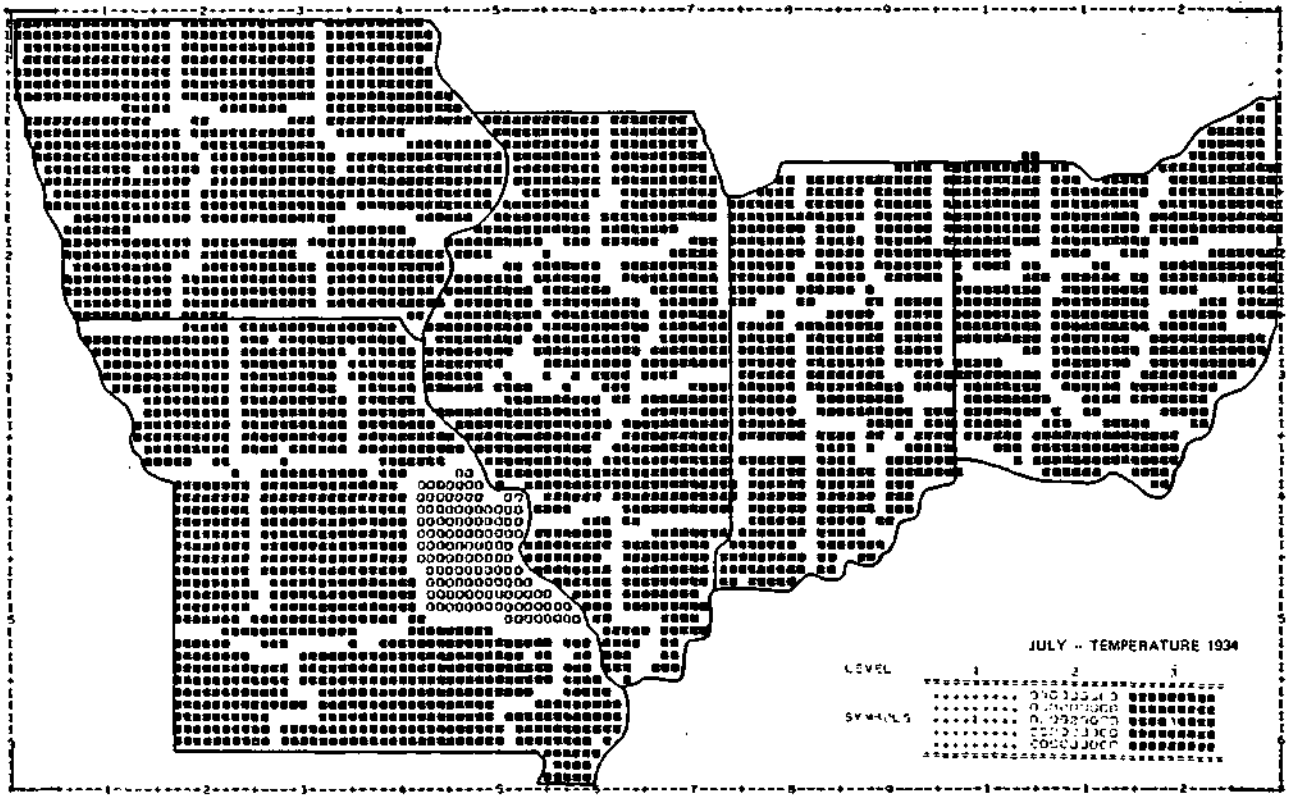
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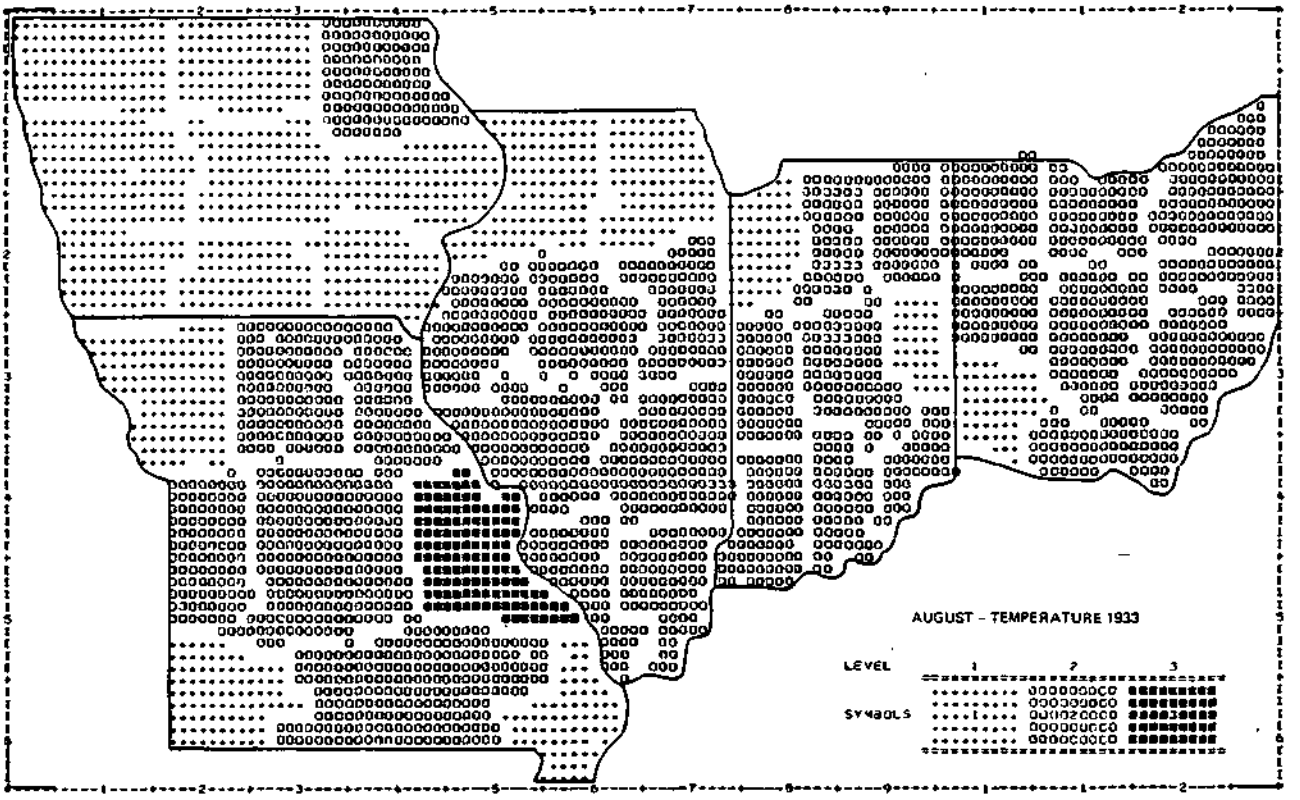
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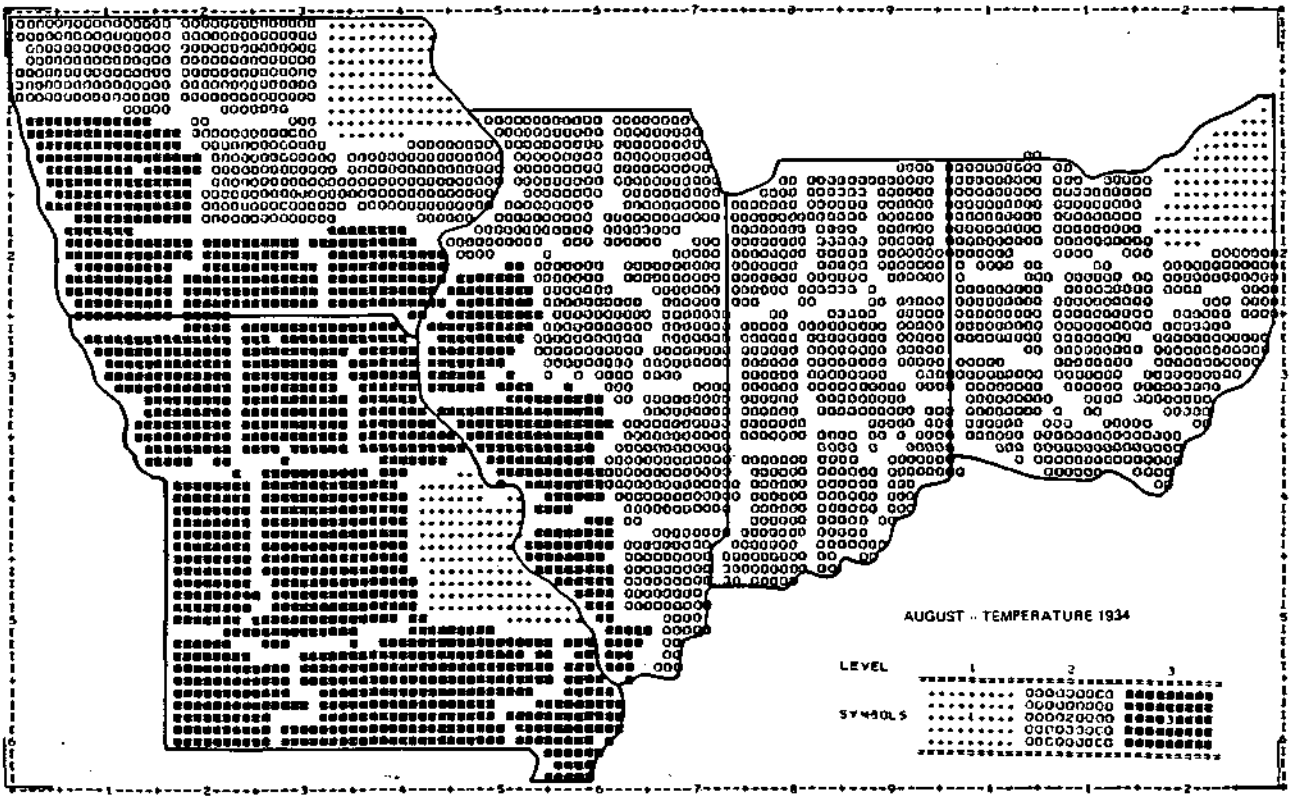
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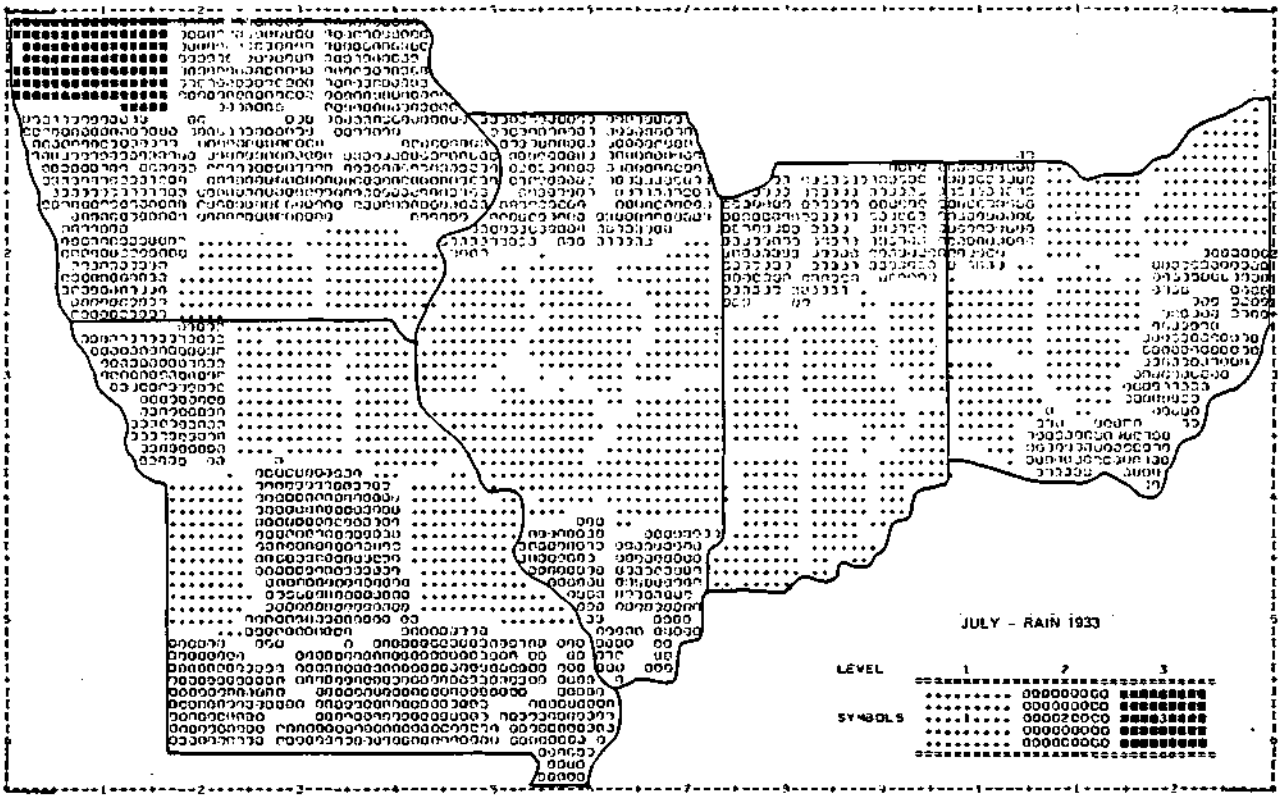
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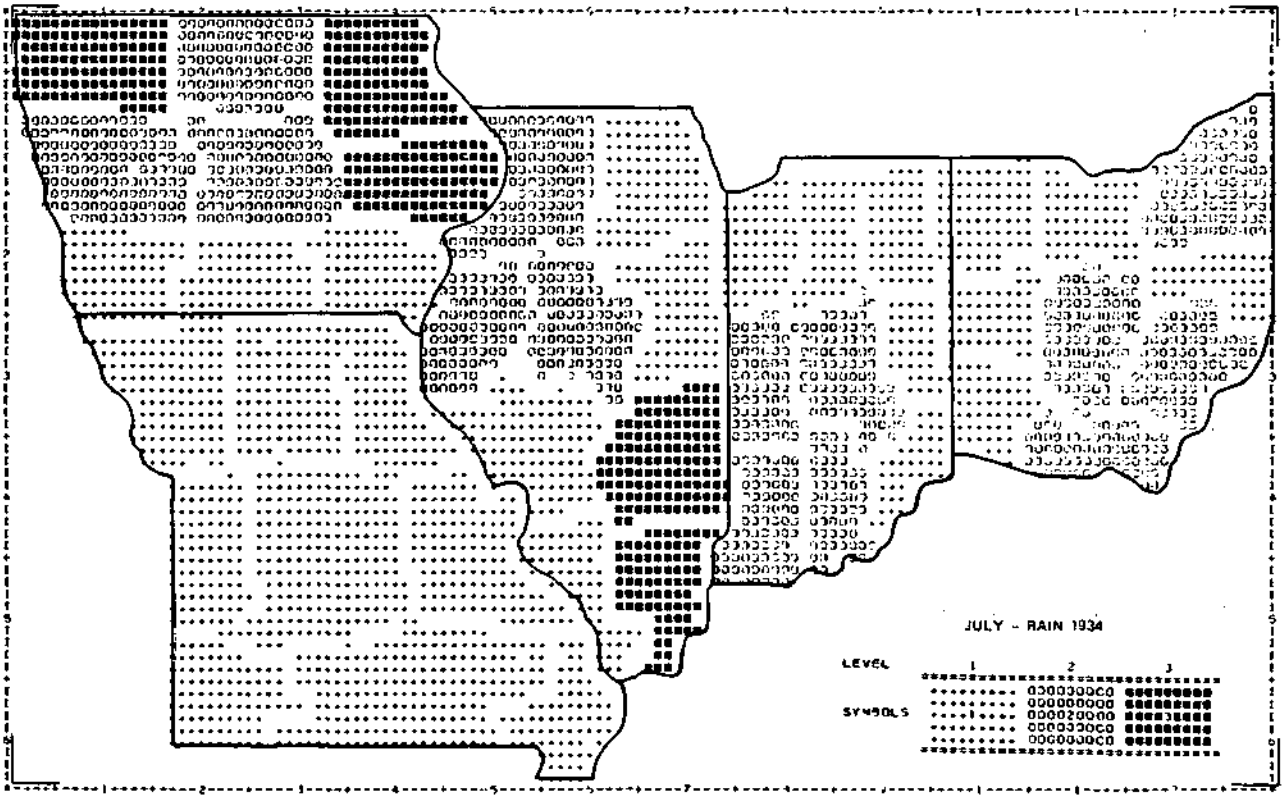
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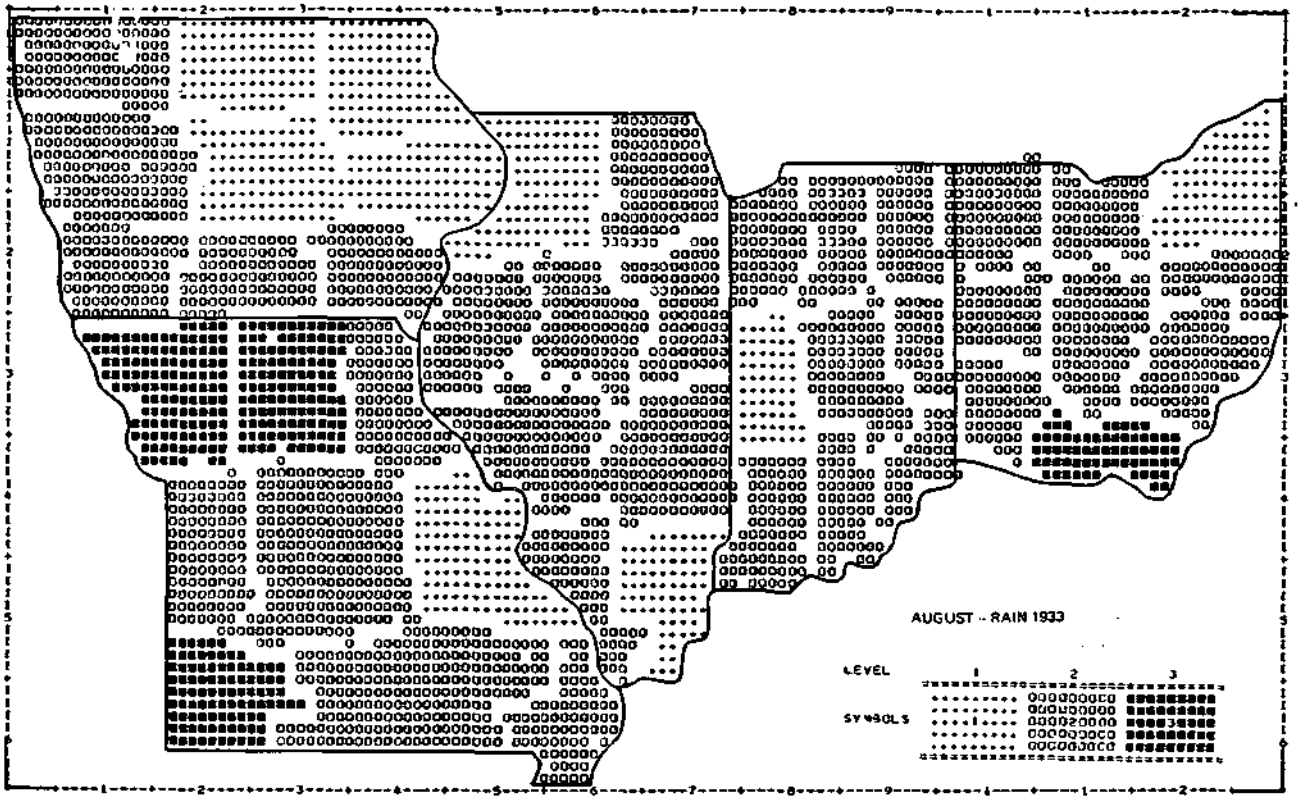
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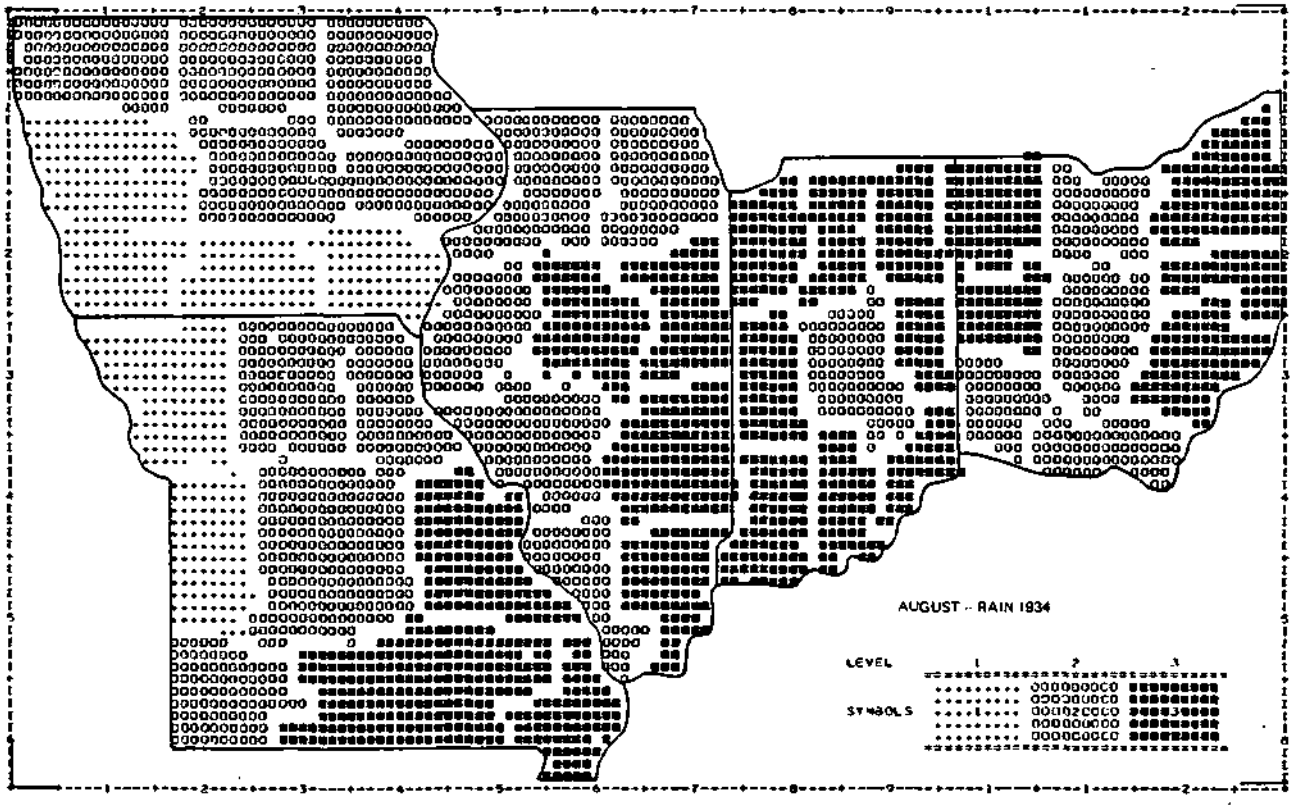
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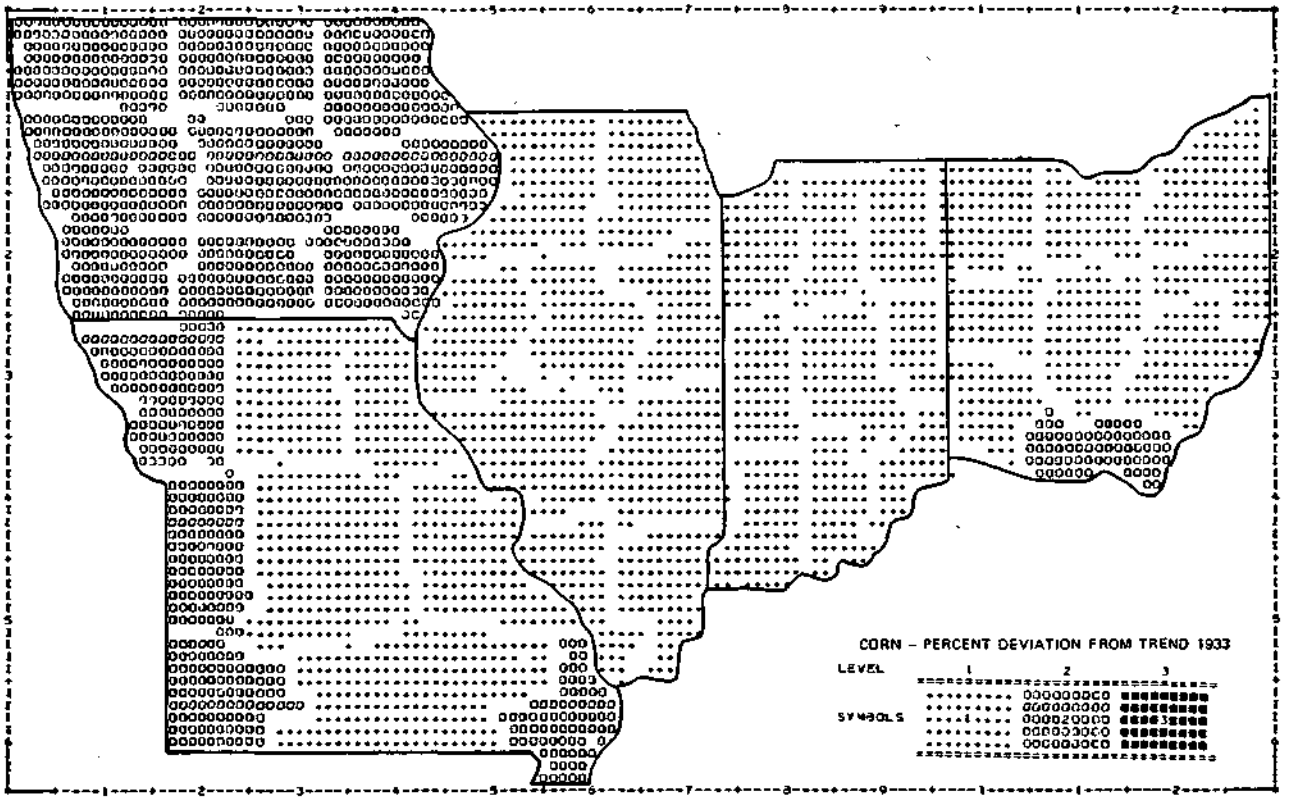
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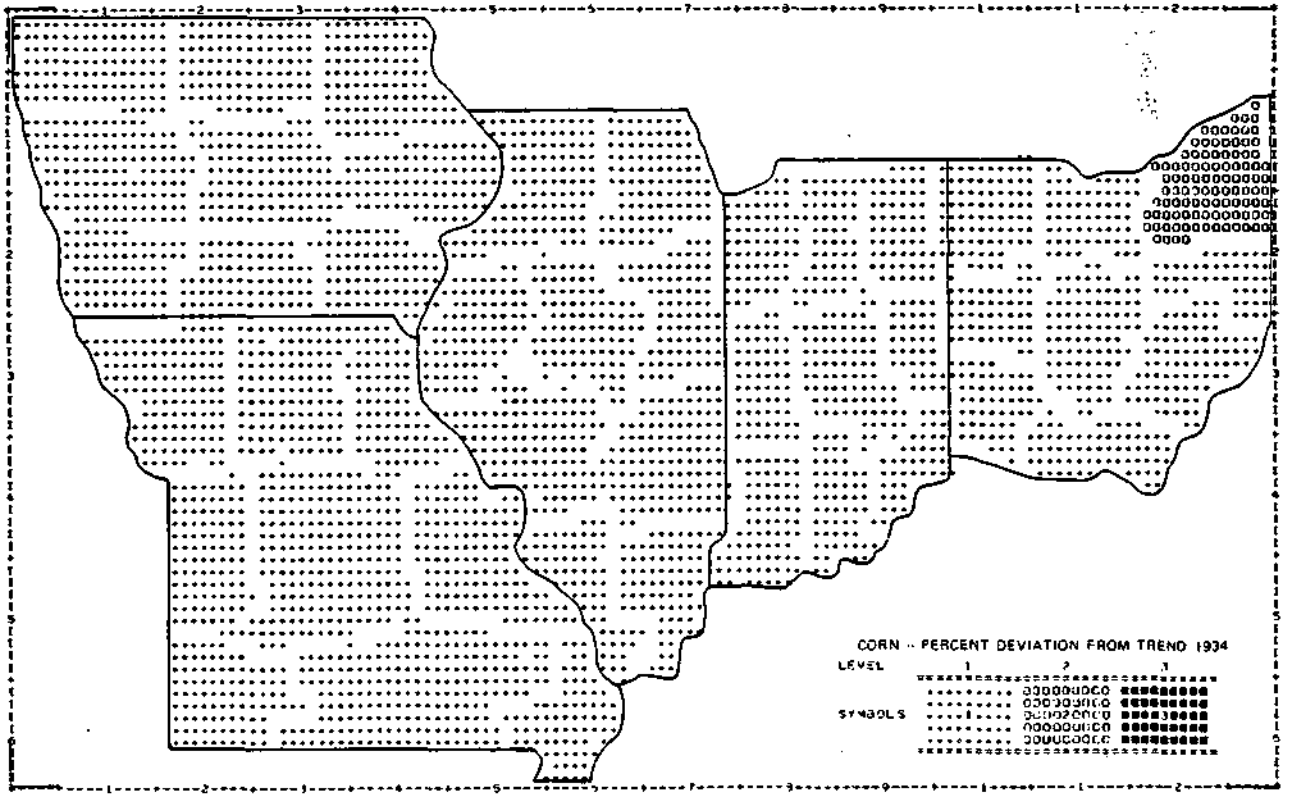
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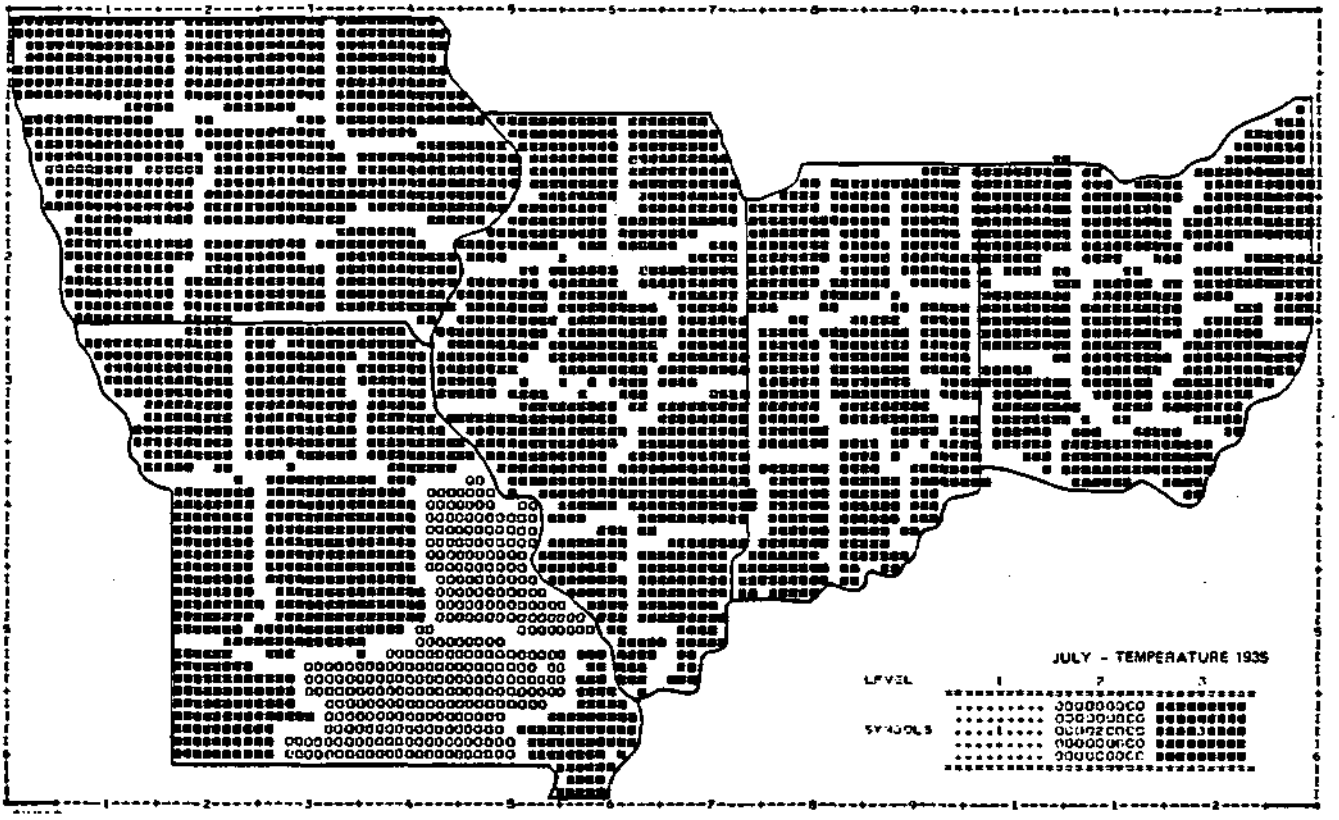
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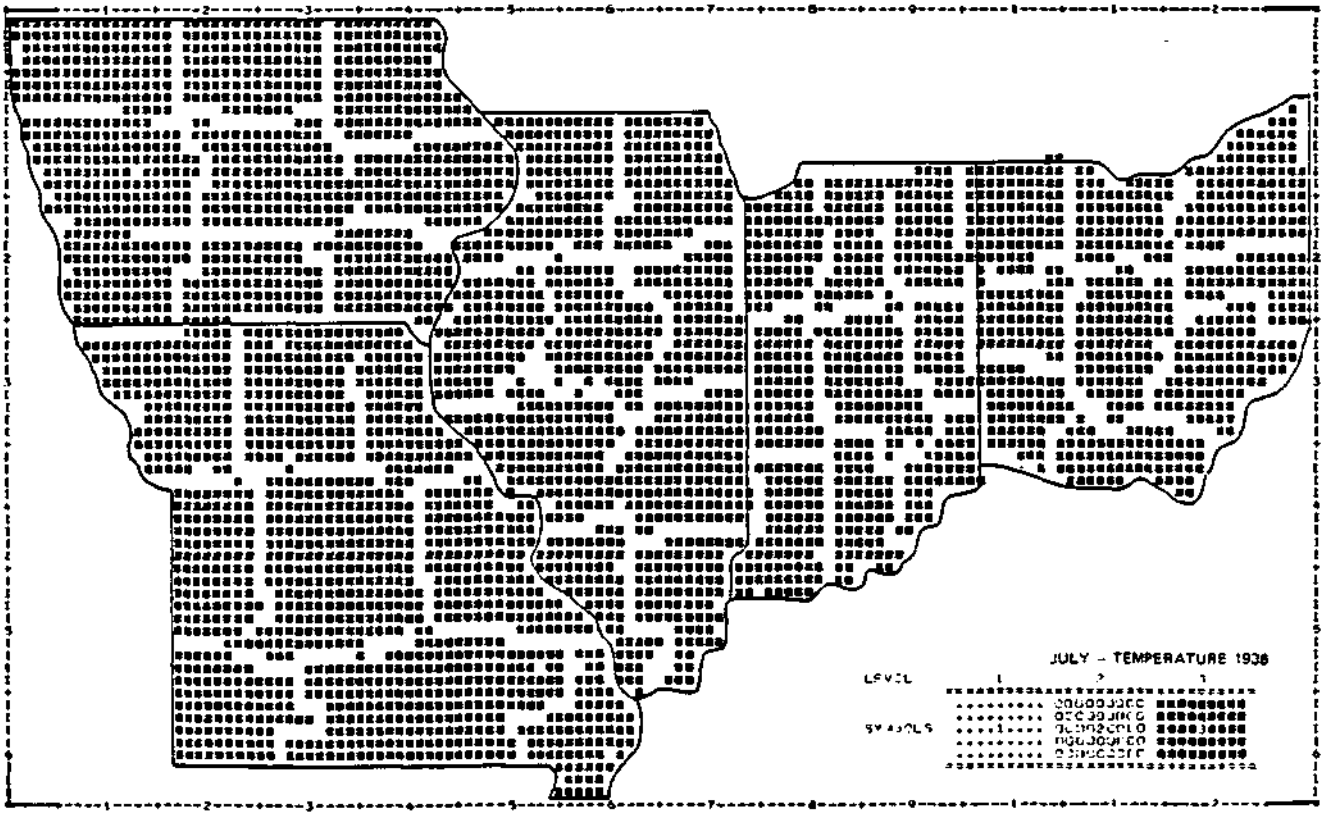
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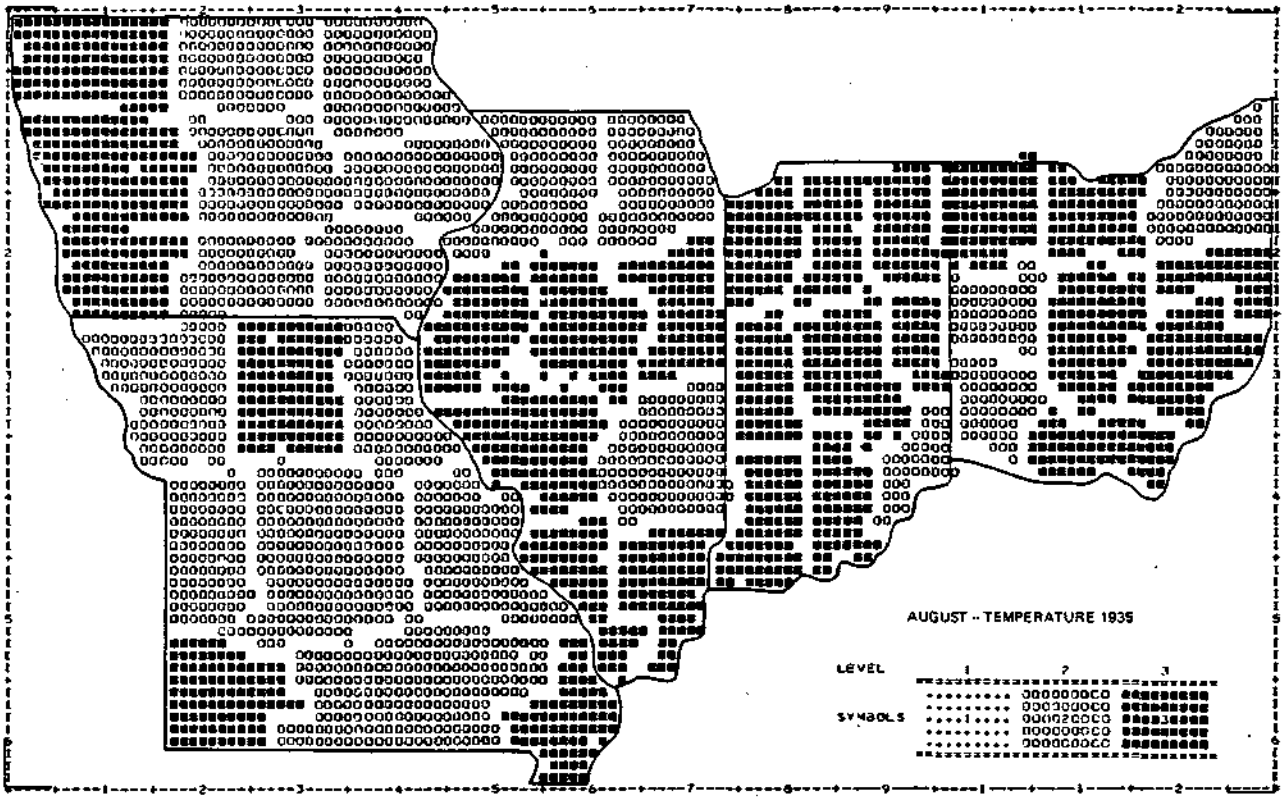
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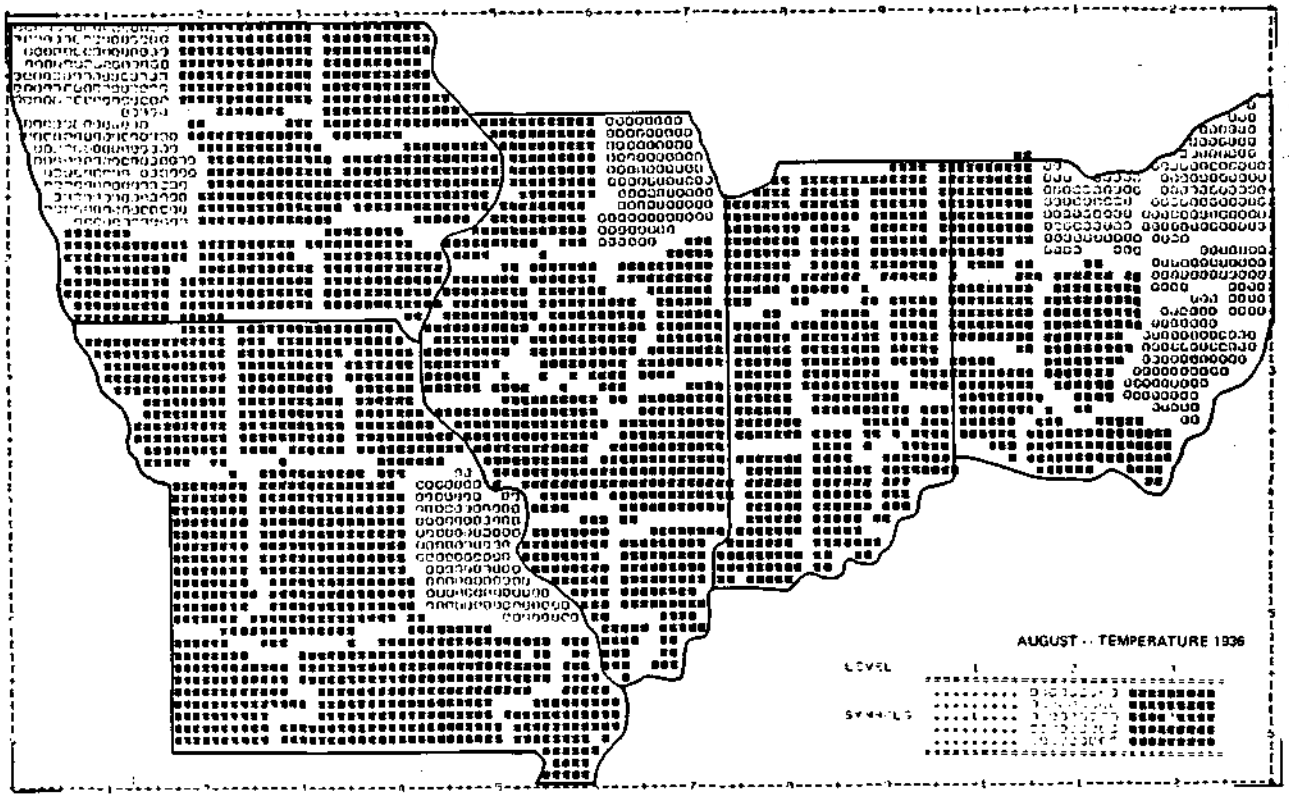
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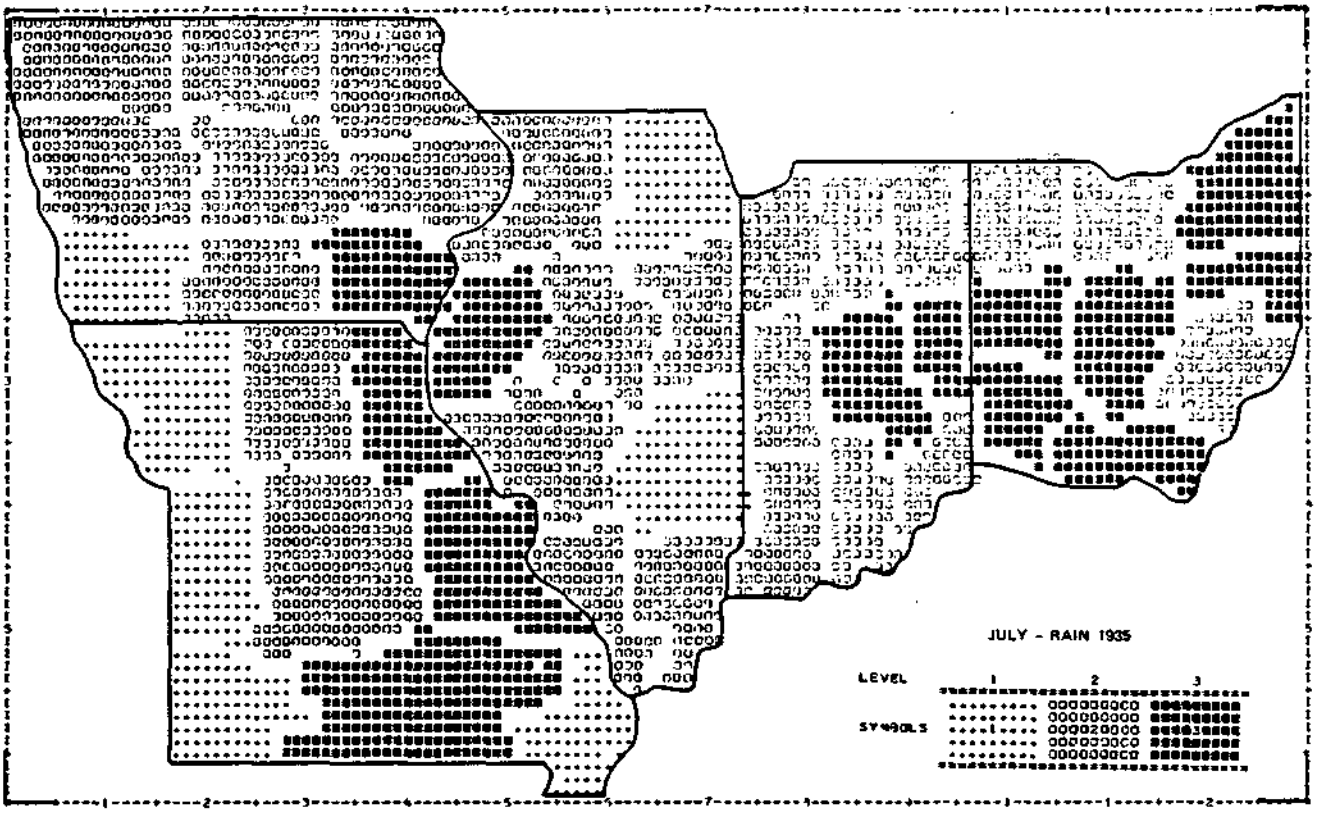
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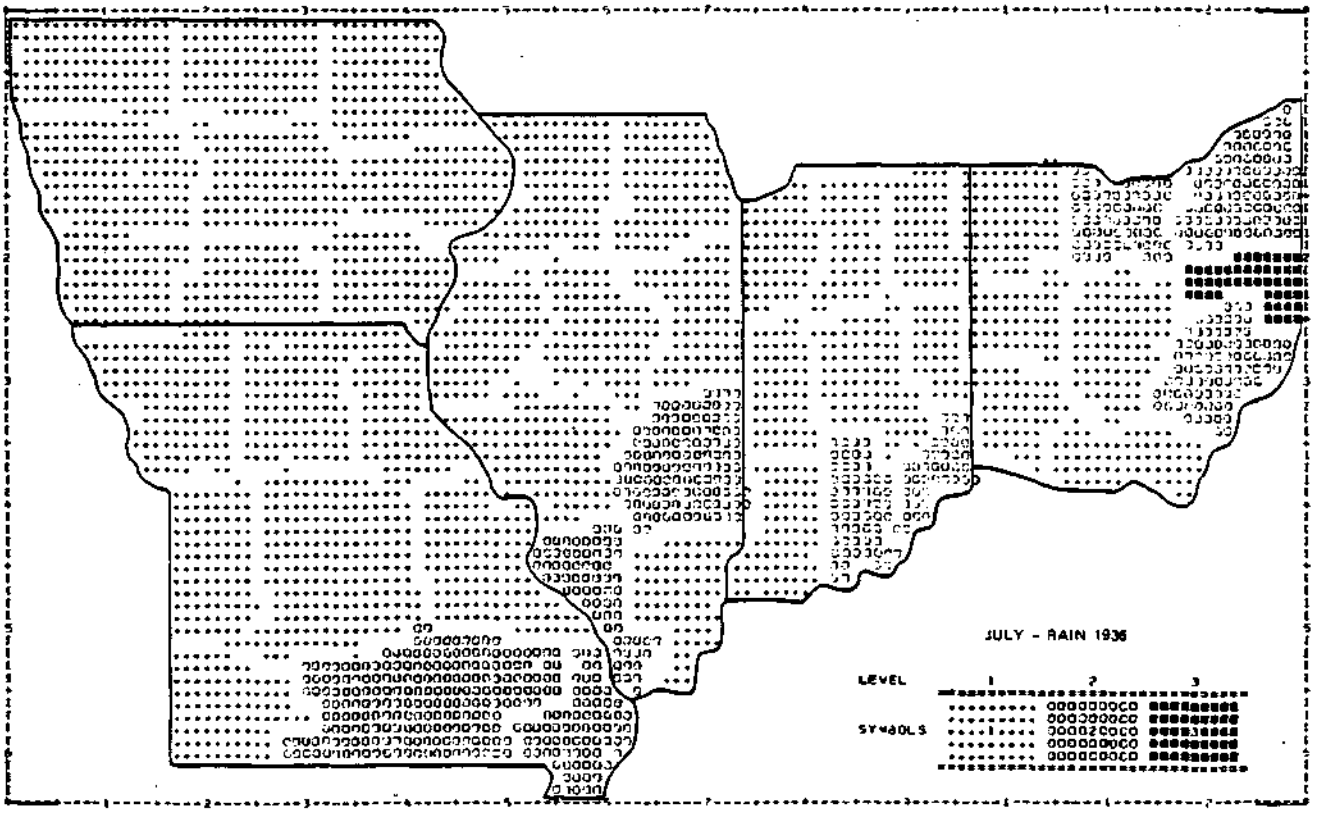
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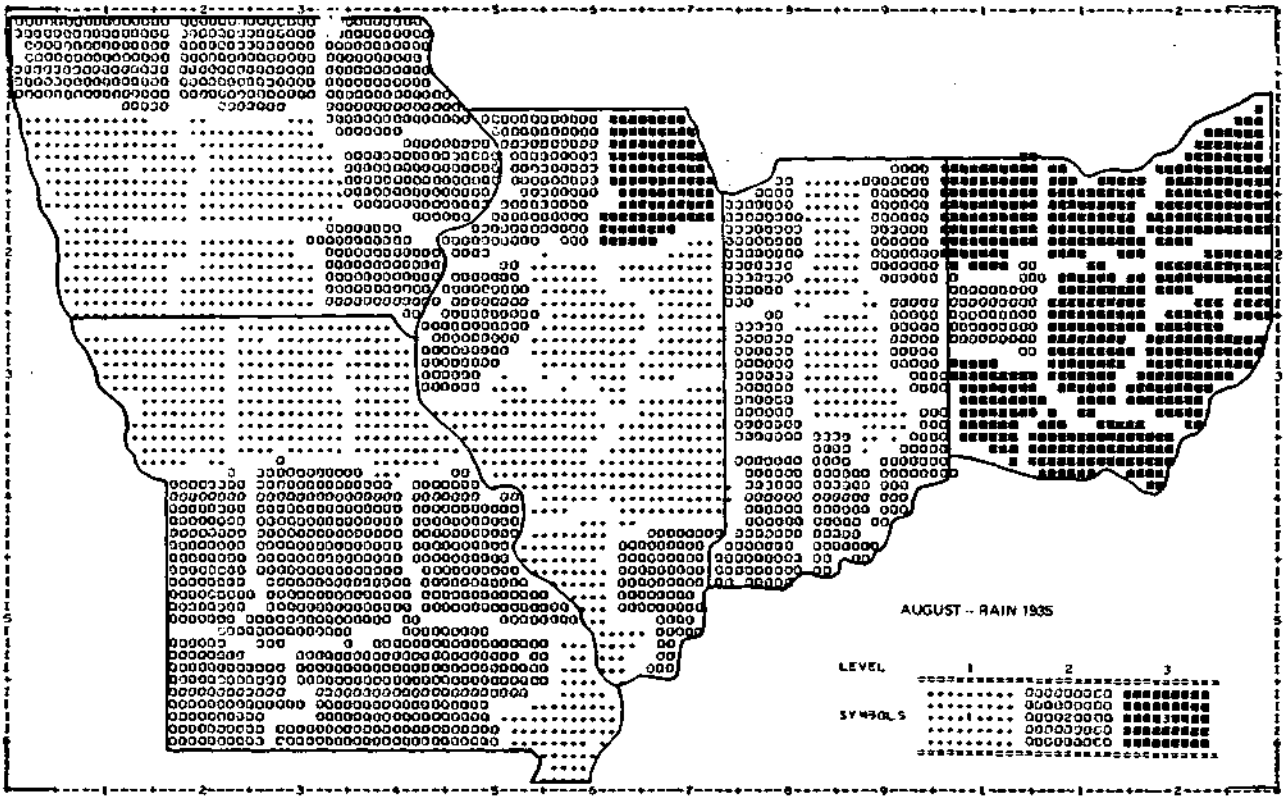
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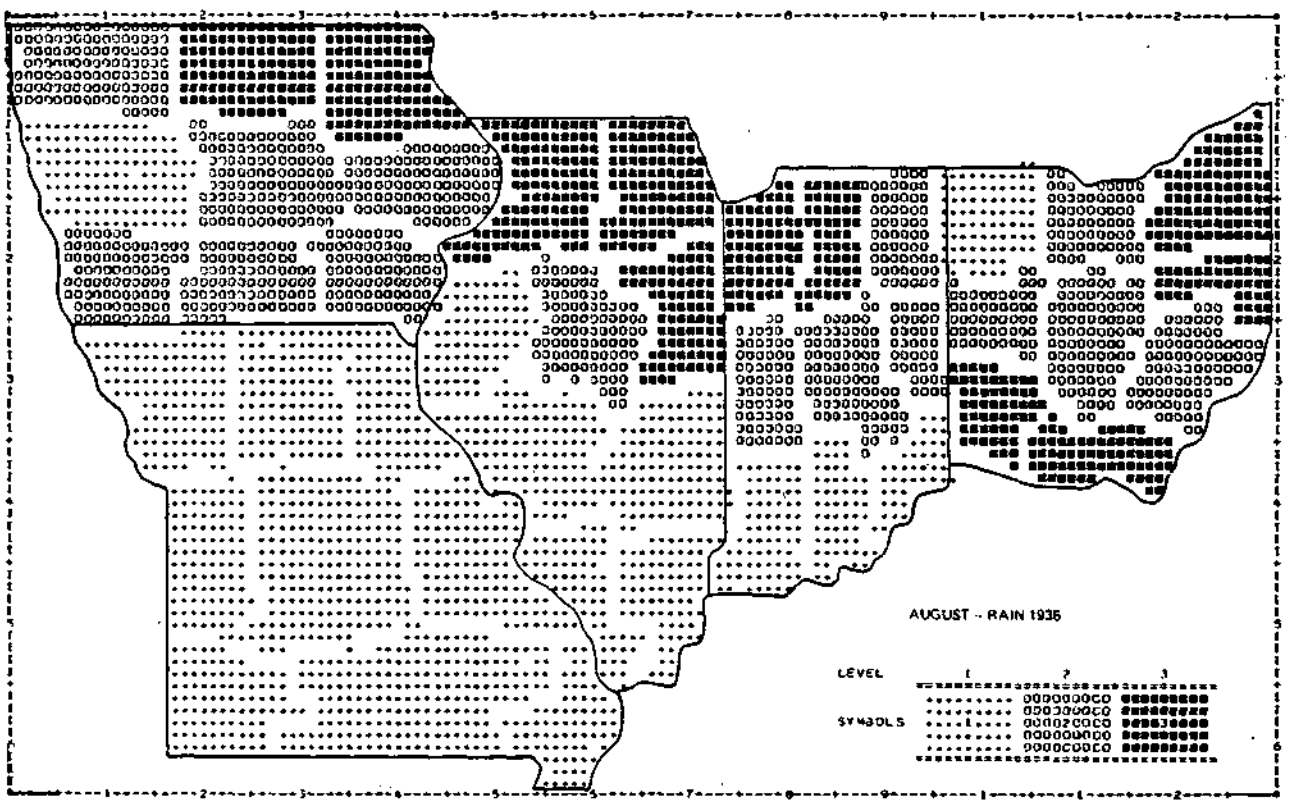
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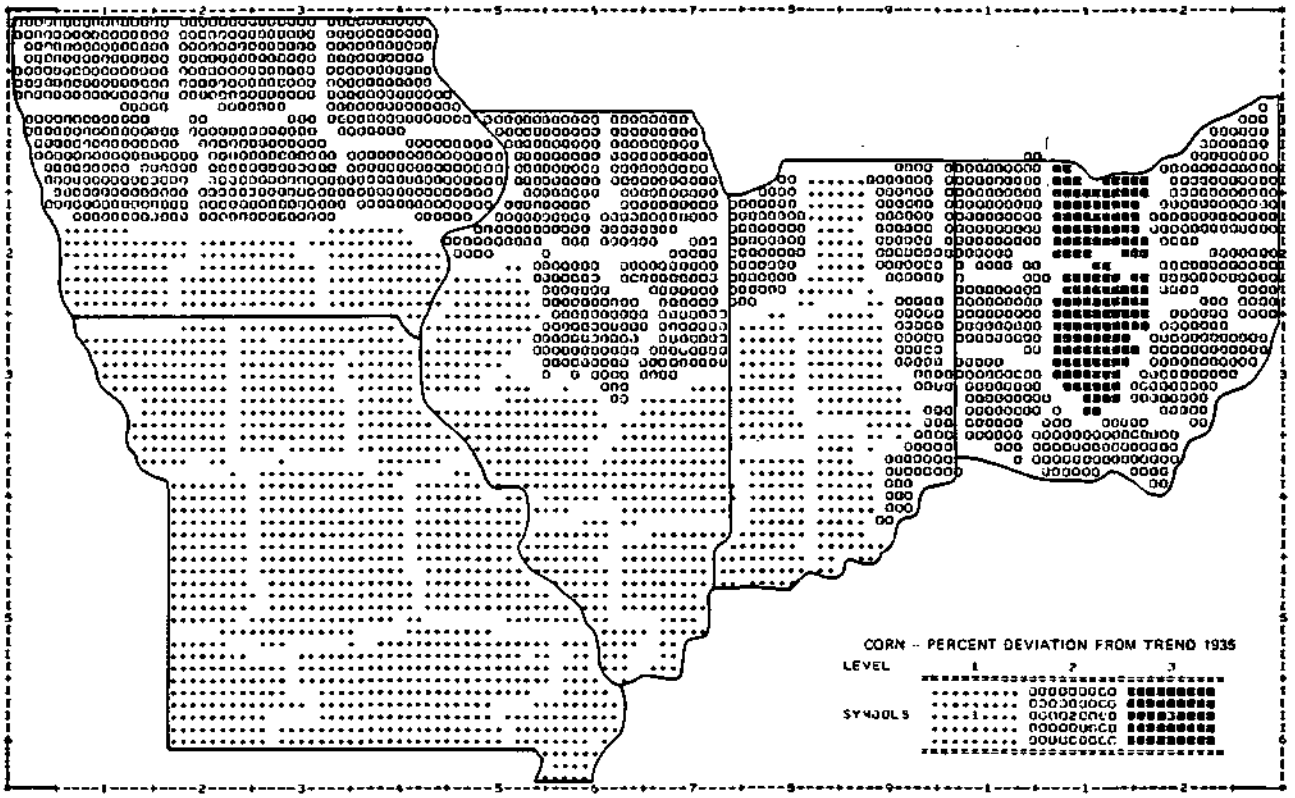
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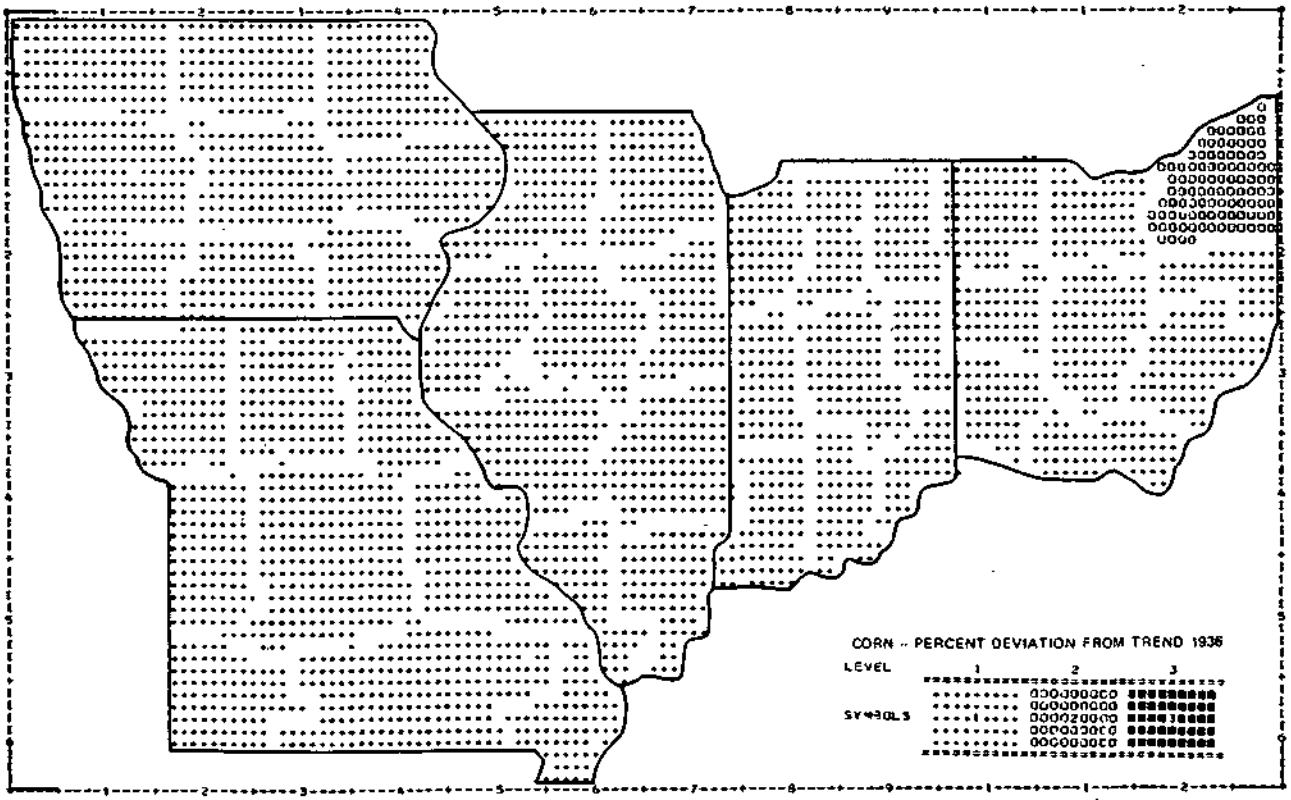
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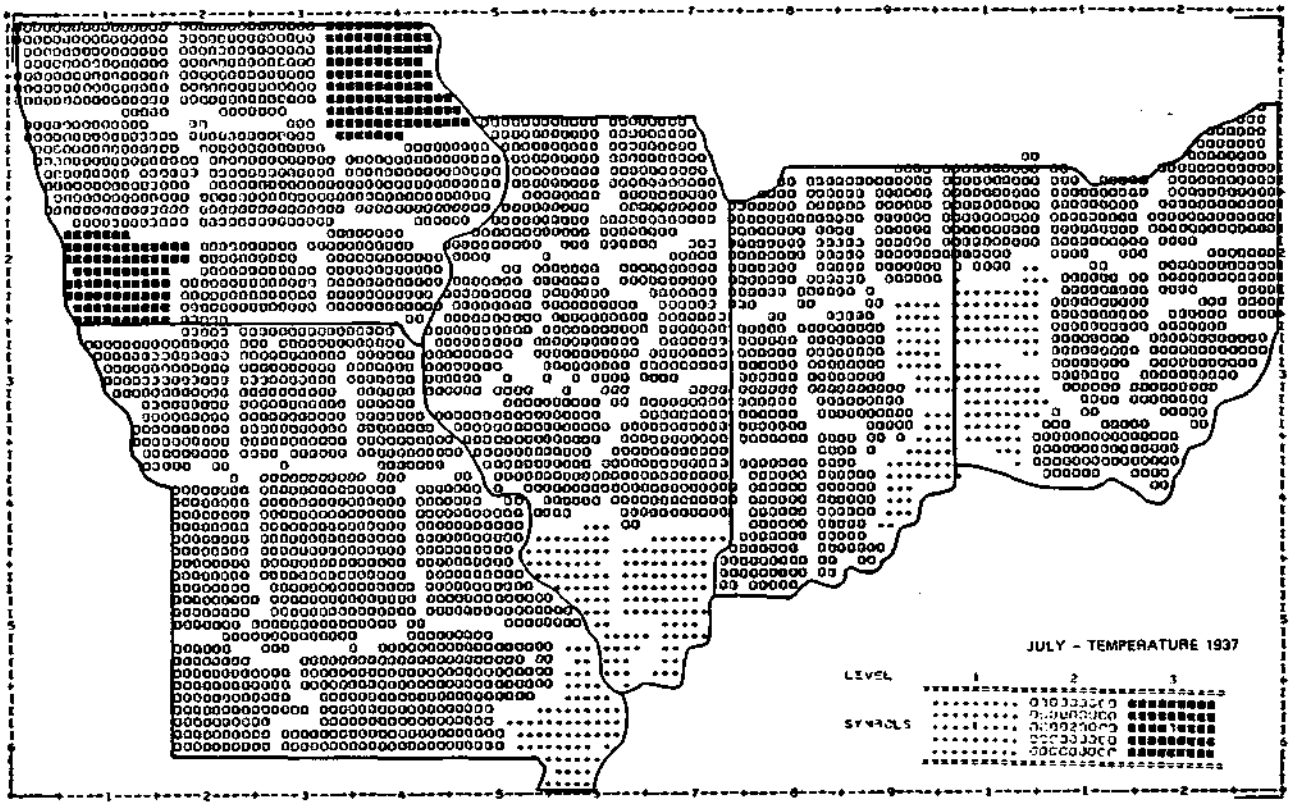
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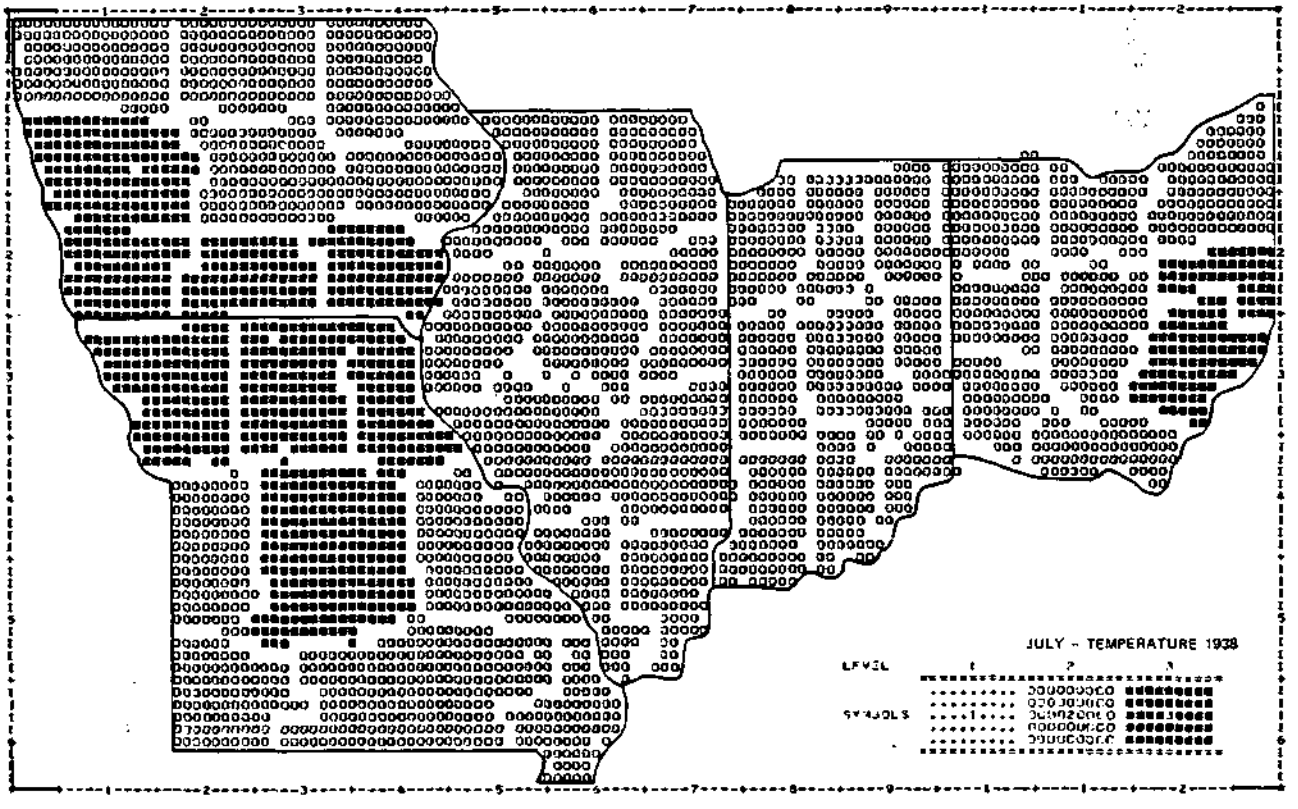
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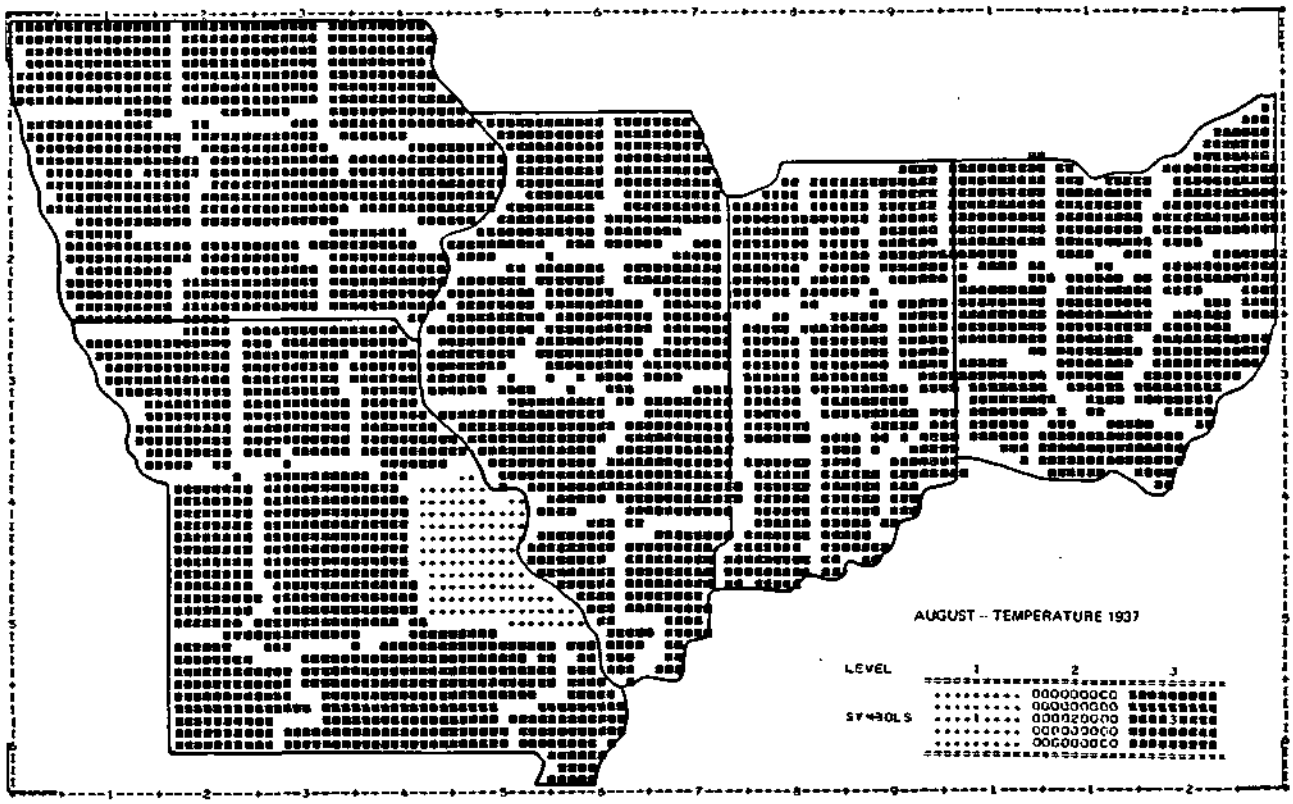
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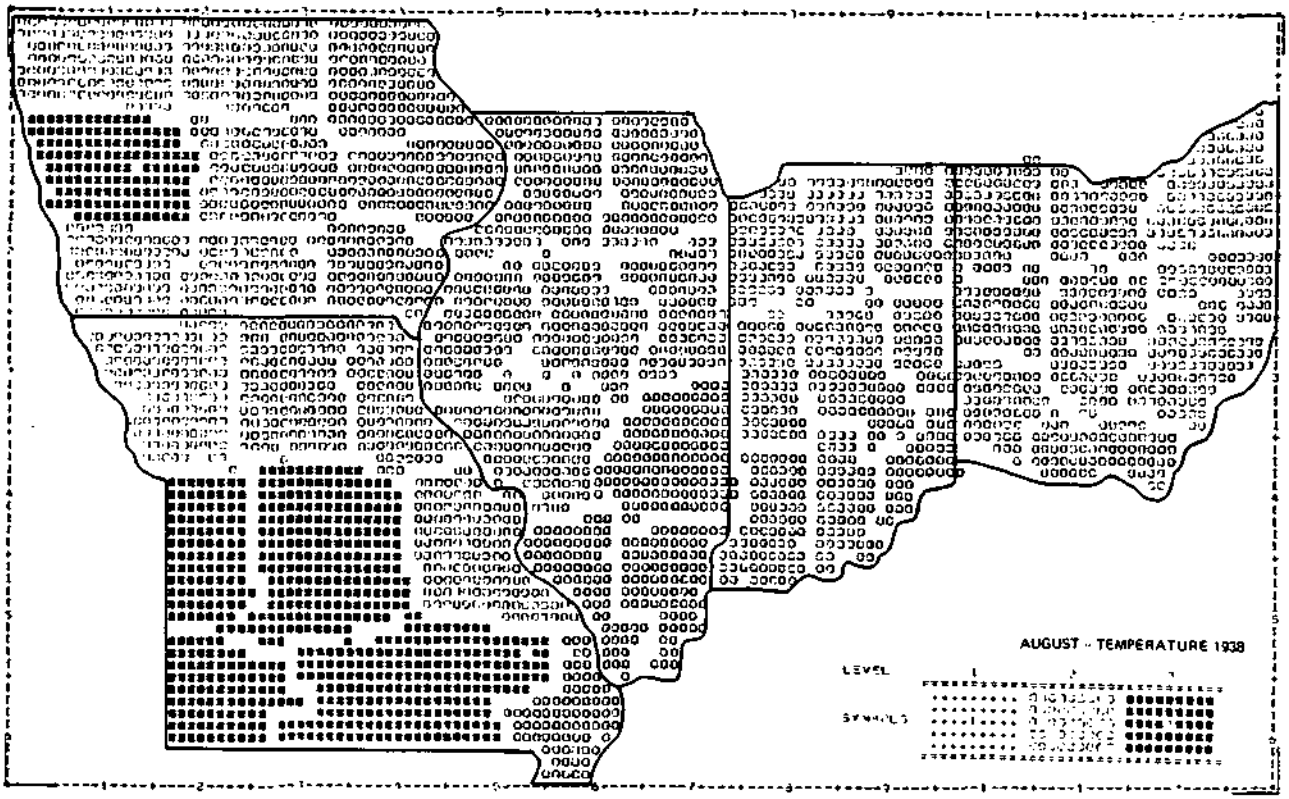
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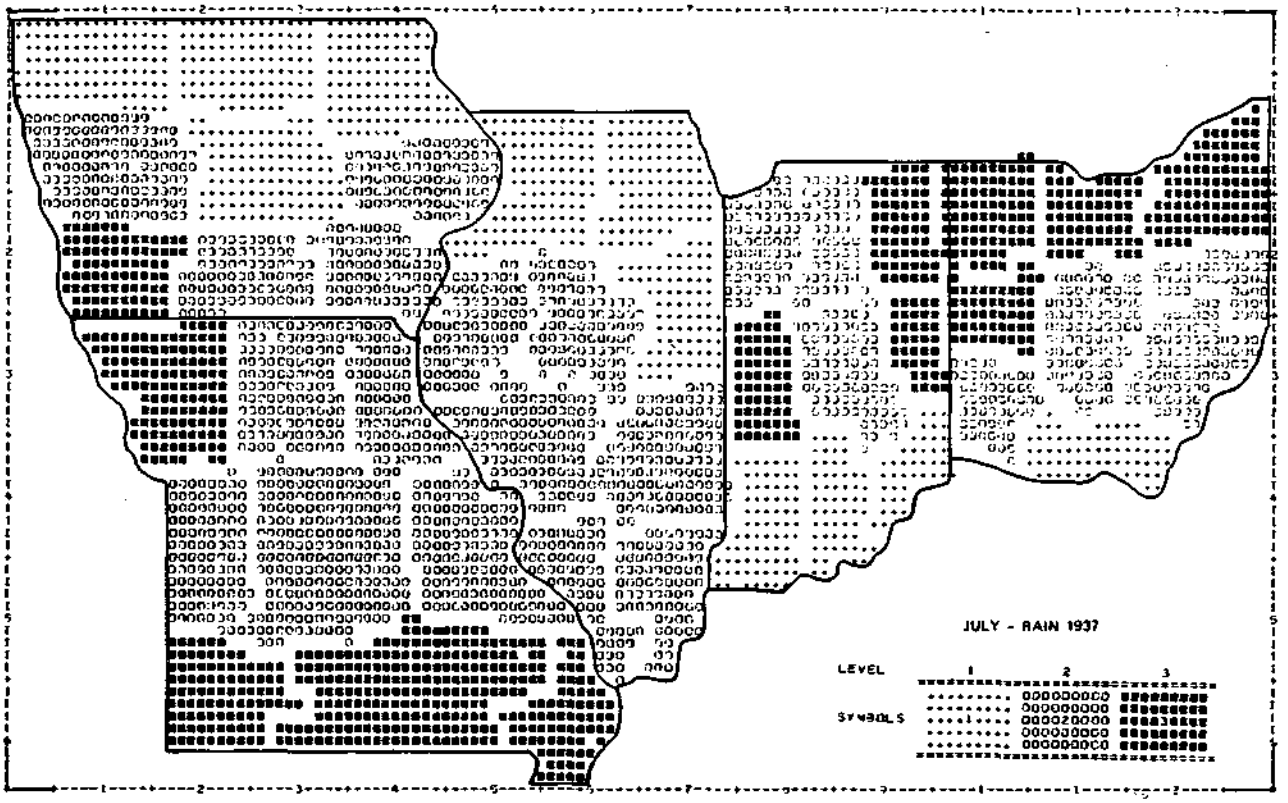
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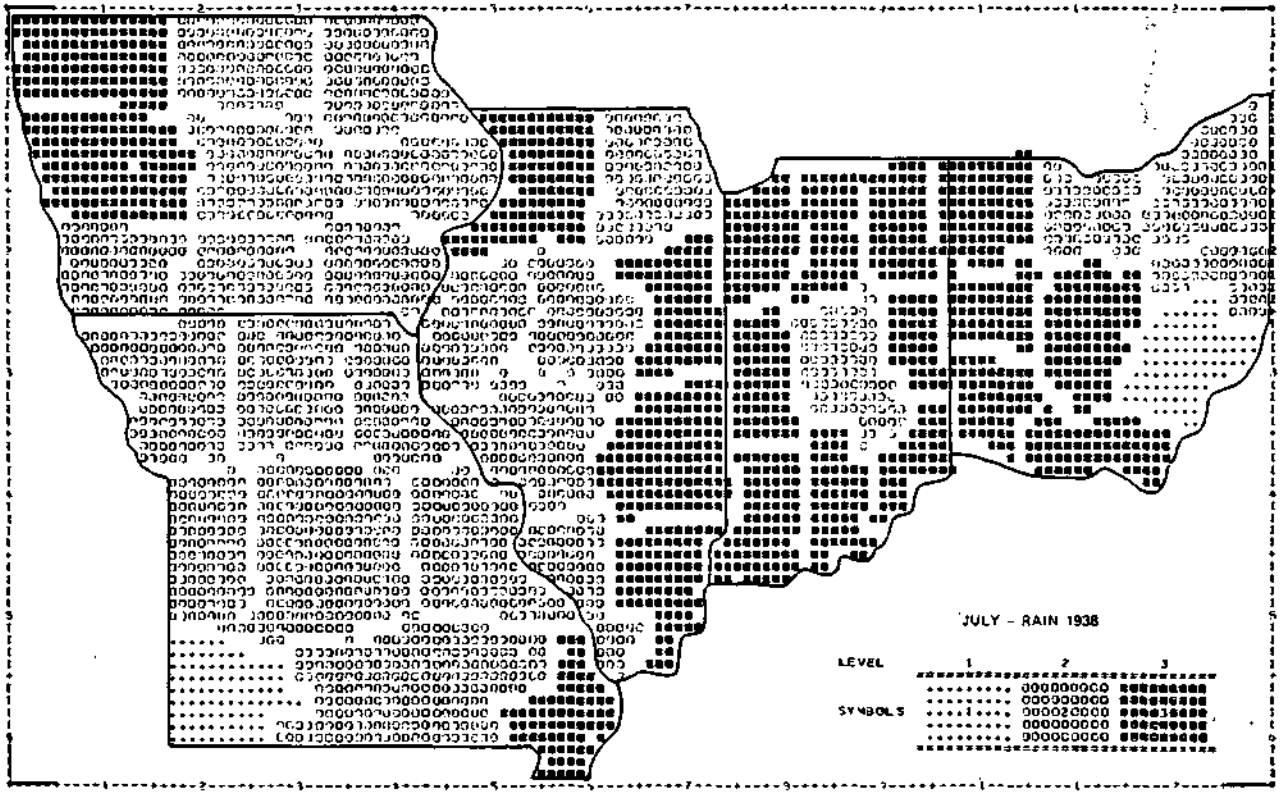
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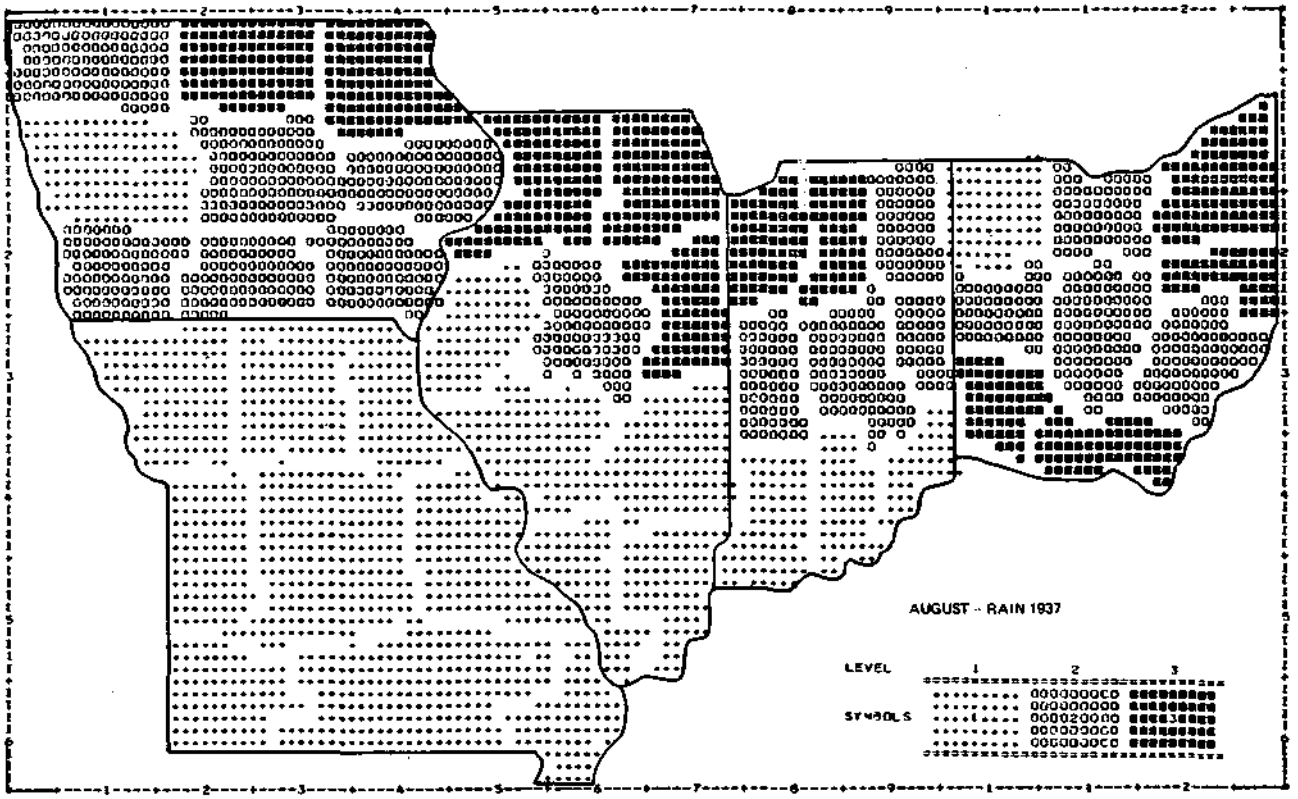
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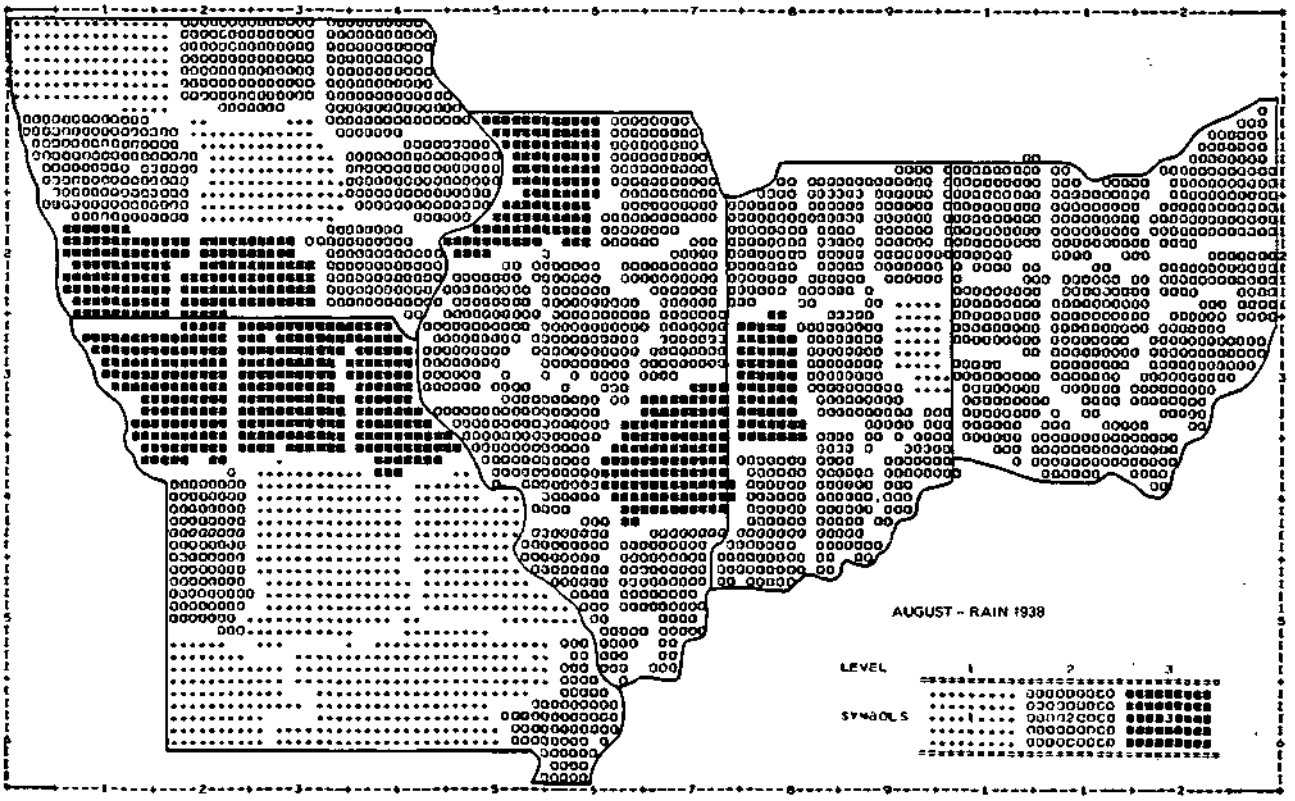
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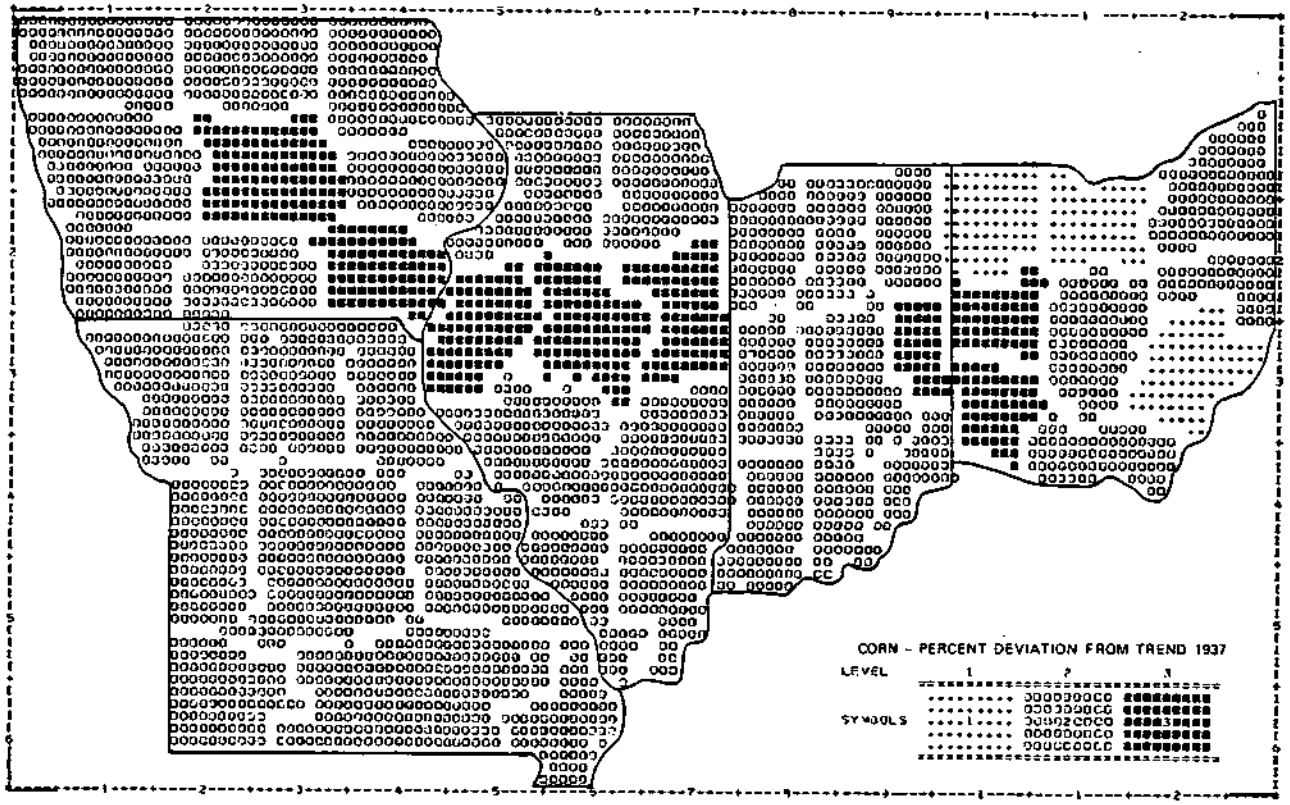
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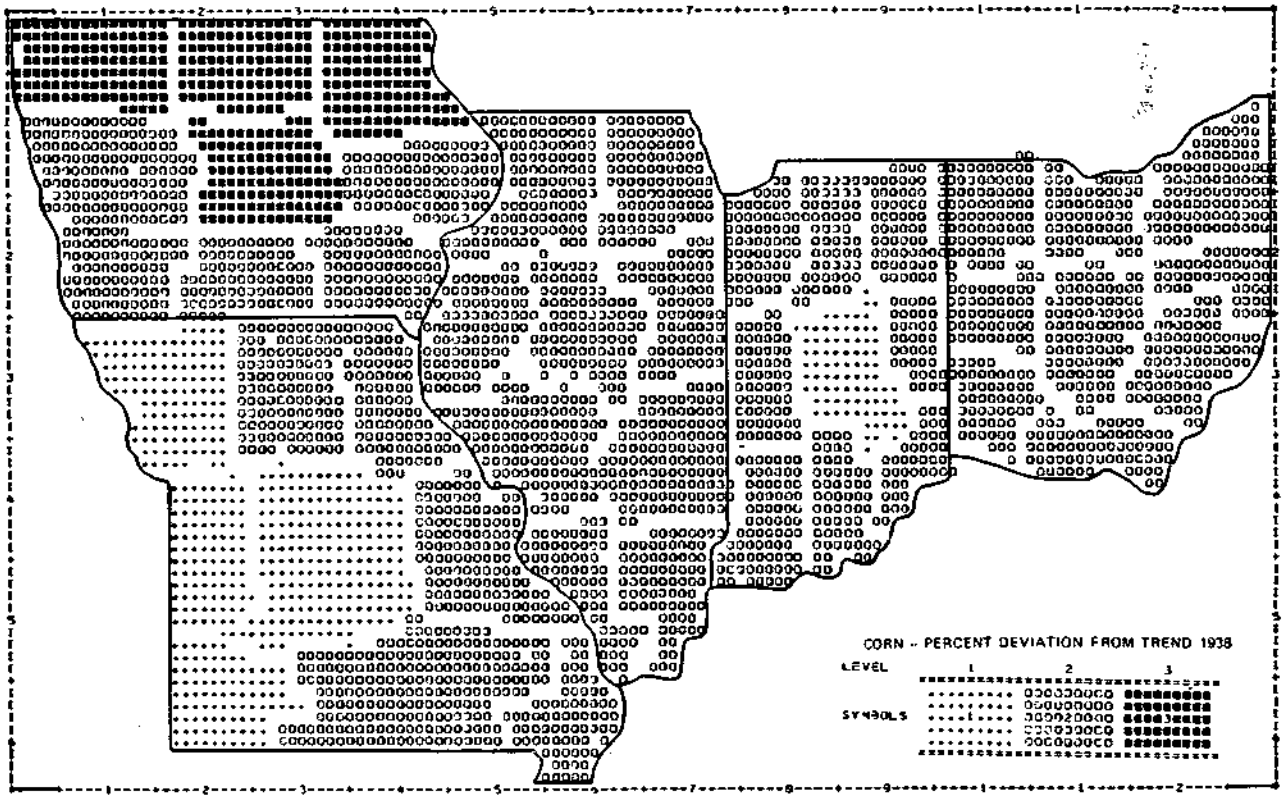
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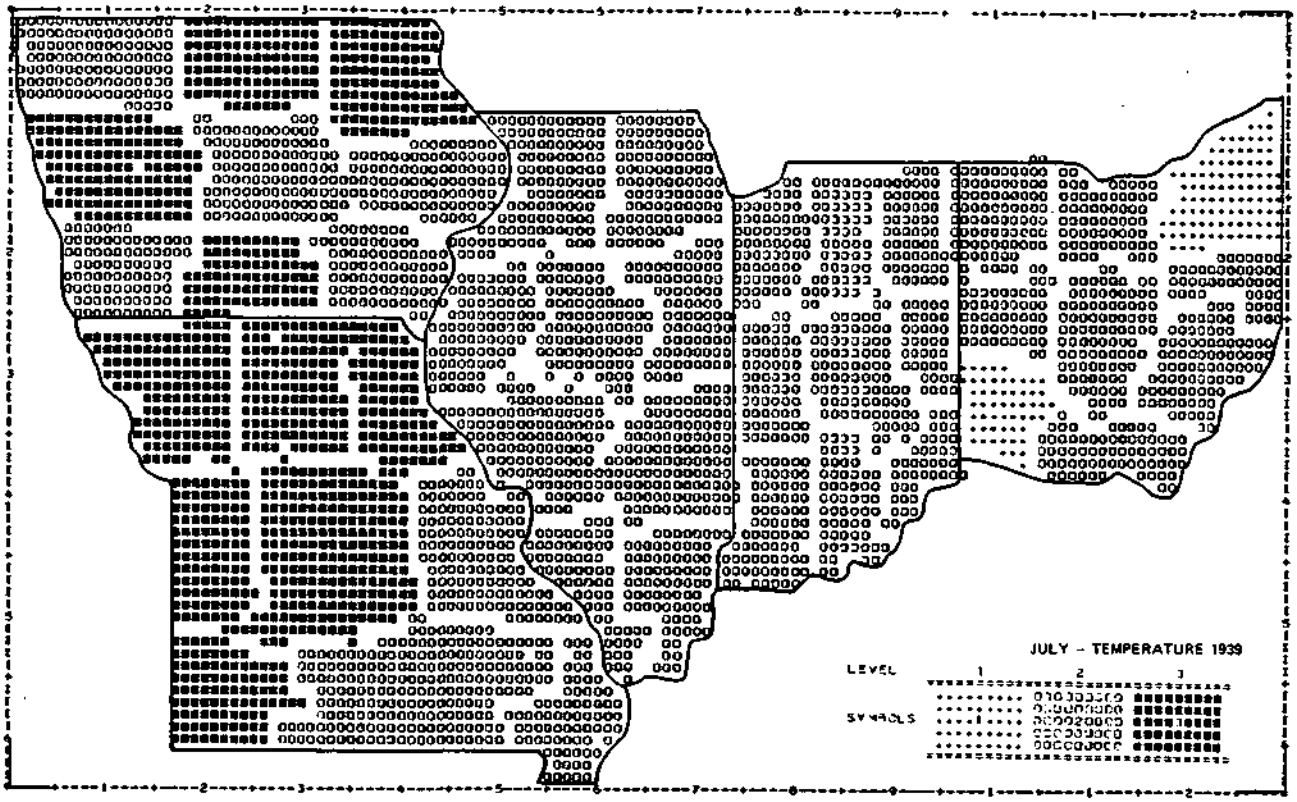
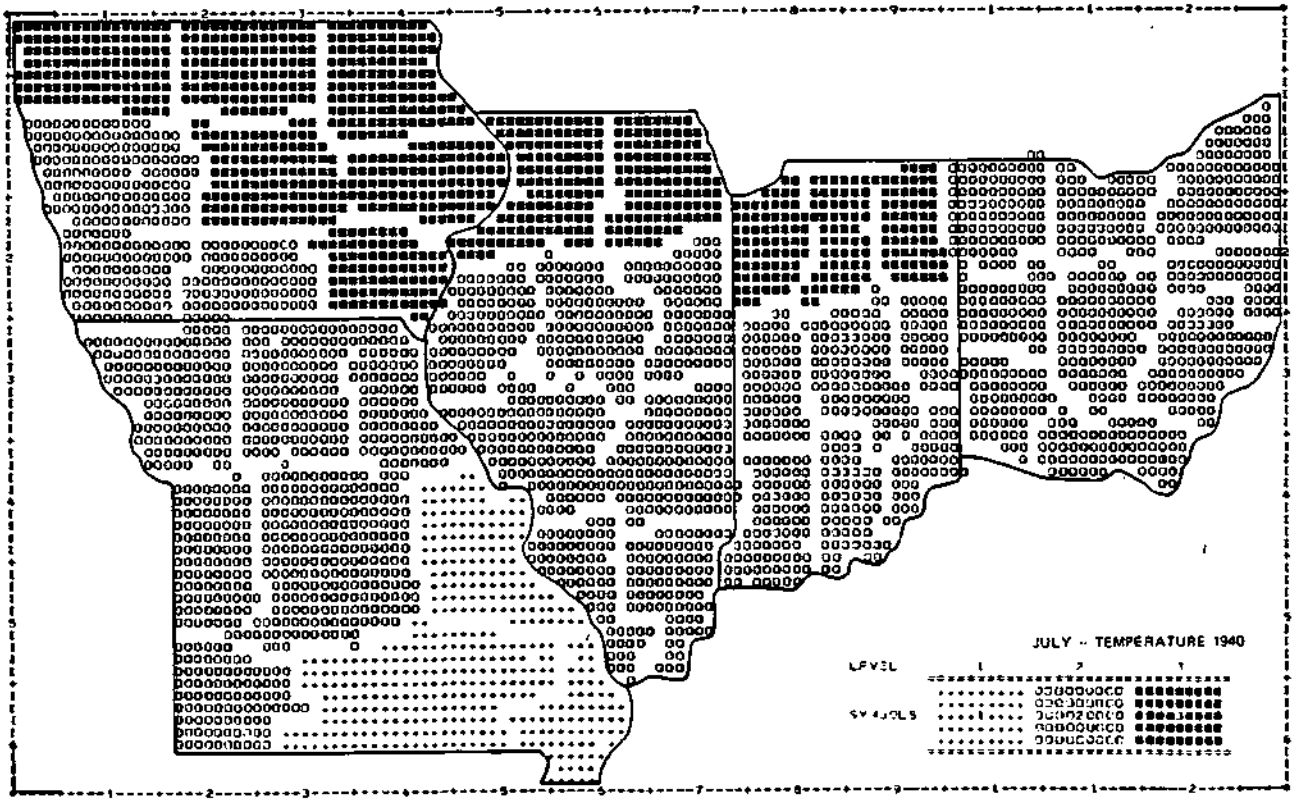
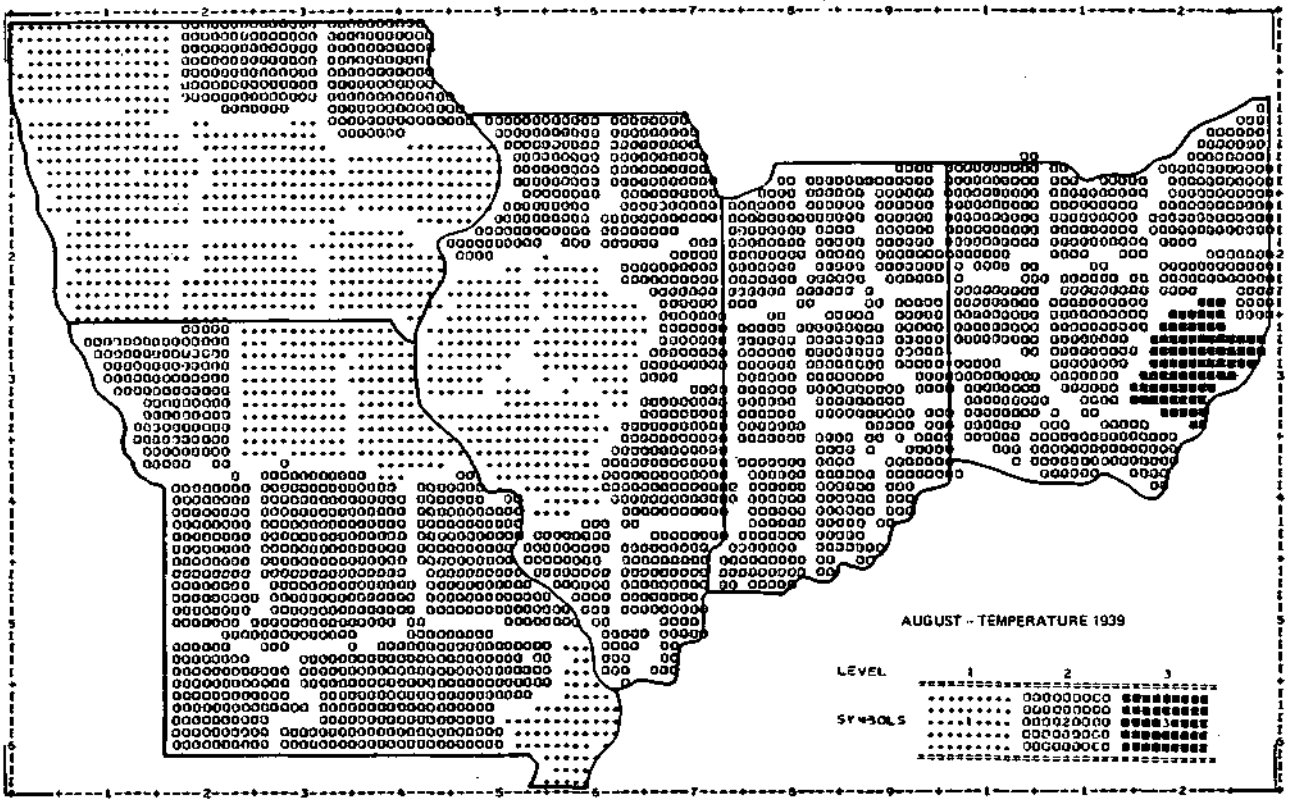
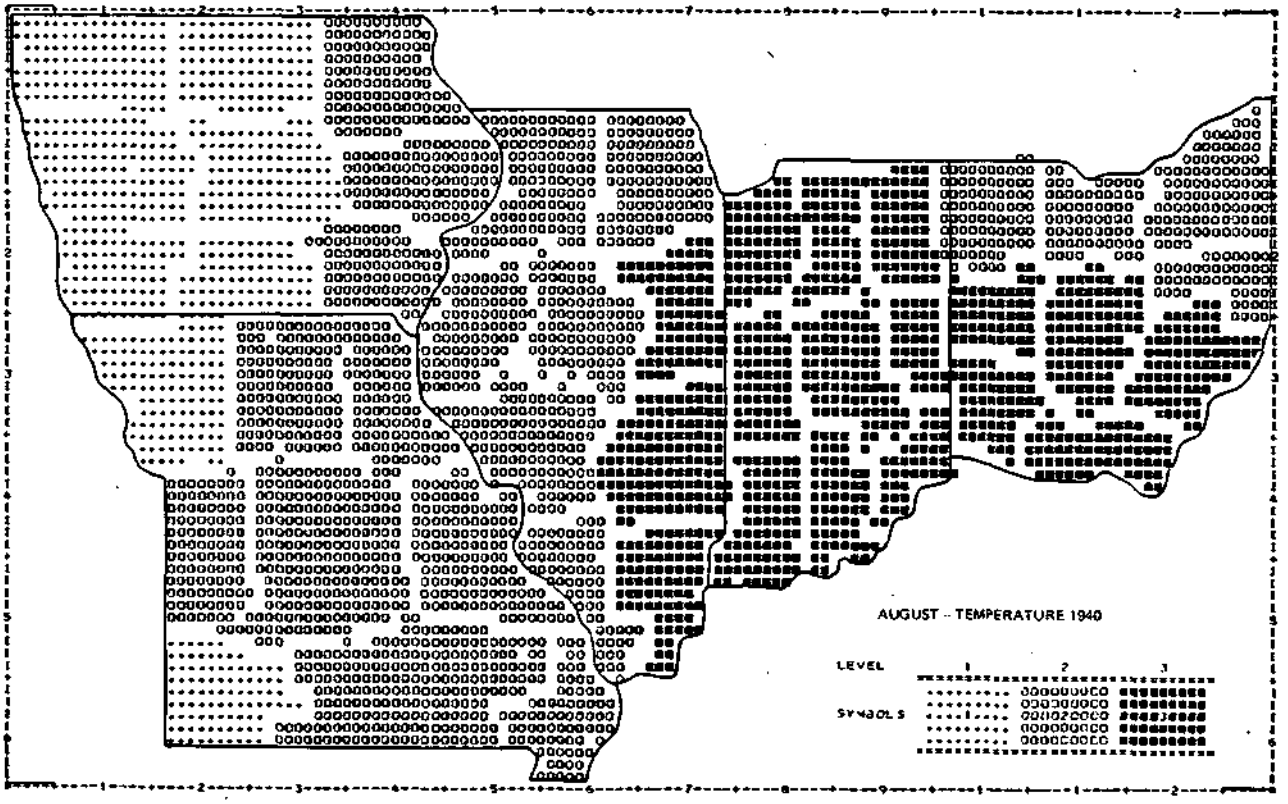

JULY - TEMPERATURE 1939
LEVEL
SYMBOLS


JULY - TEMPERATURE 1940
LEVEL
SYMBOLS


AUGUST - TEMPERATURE 1939
LEVEL
1
2
3
SYMBOLS


AUGUST - TEMPERATURE 1940
LEVEL
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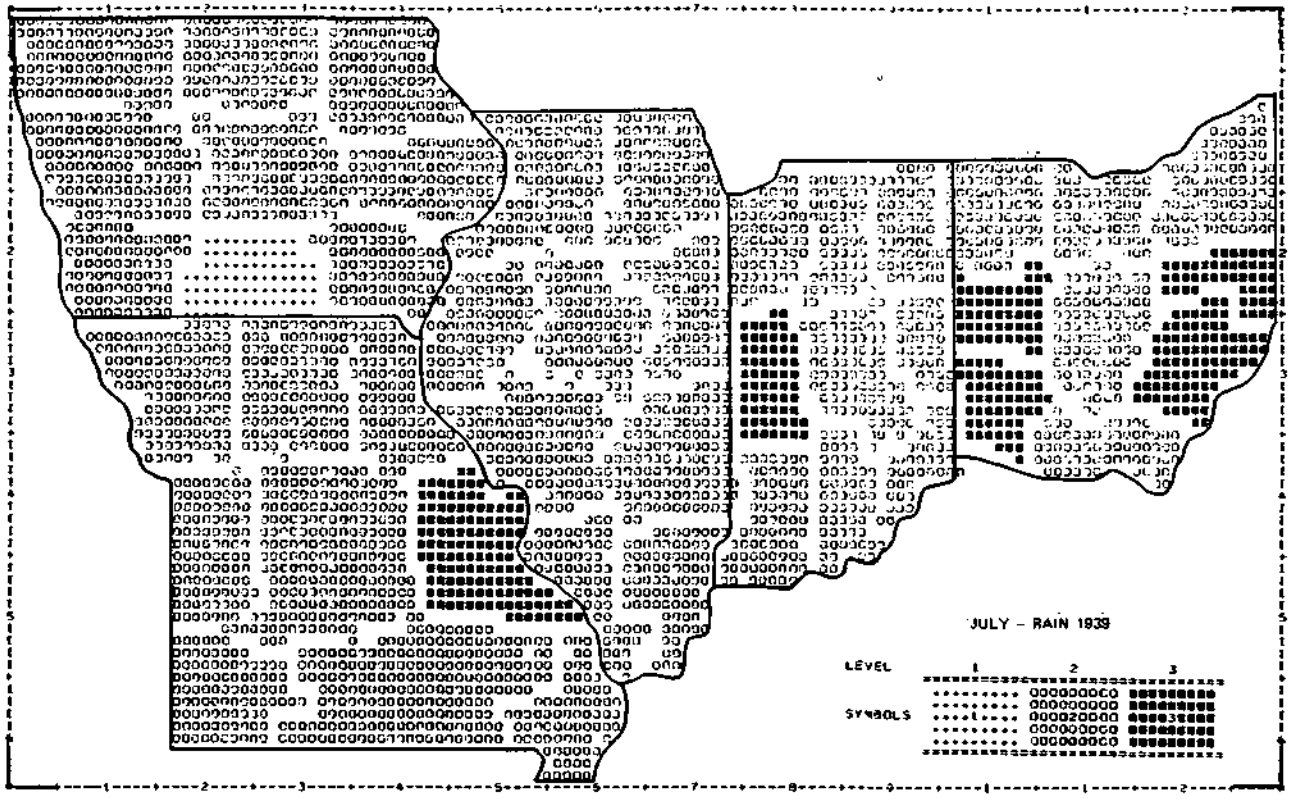
SYMBOLS


JULY – RAIN 1939
LEVEL
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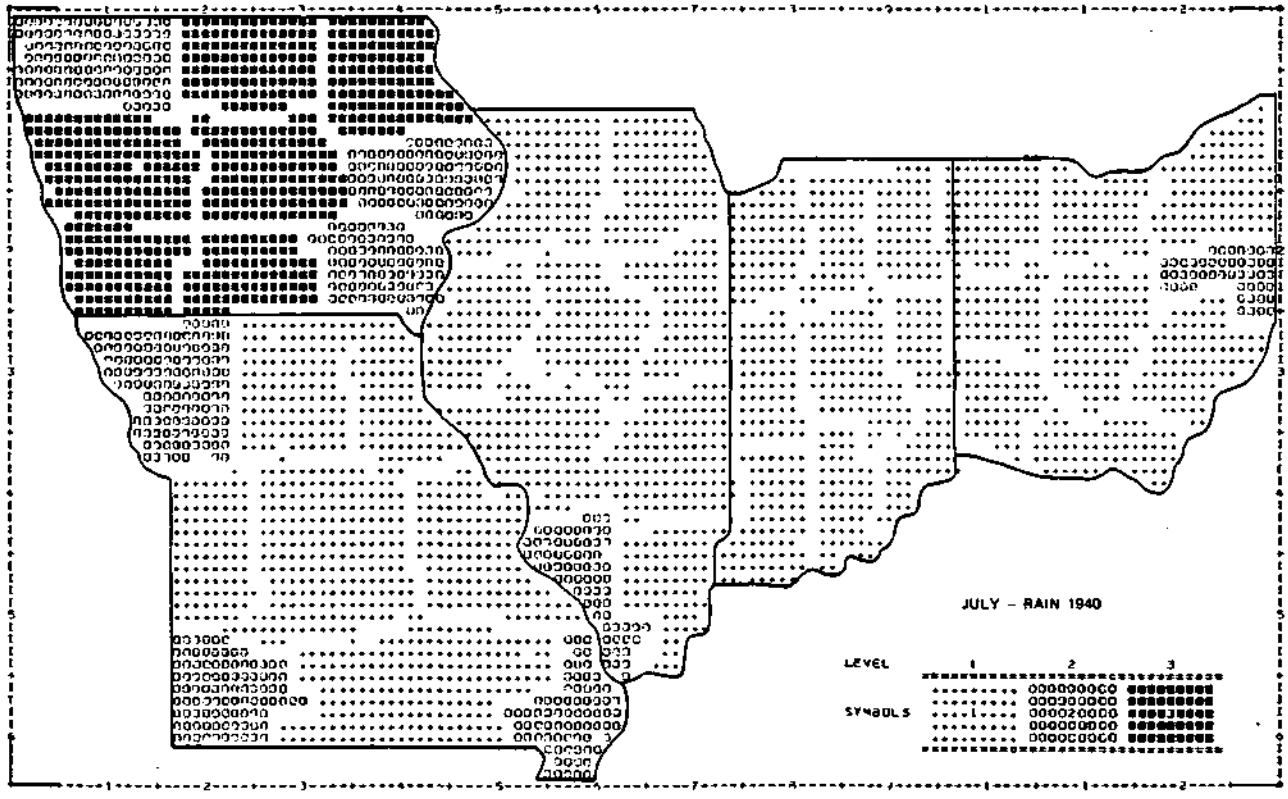
SYMBOLS


JULY – RAIN 1940
LEVEL
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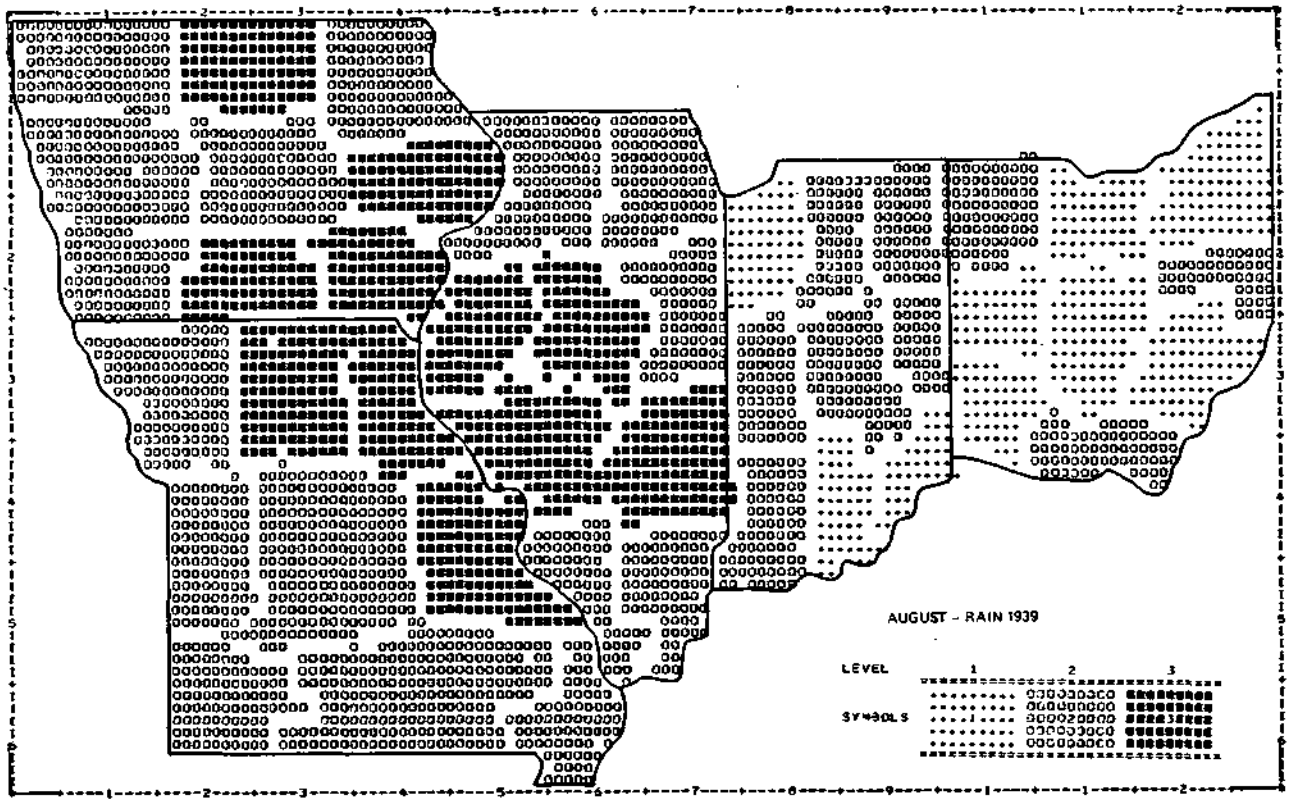
SYMBOLS


AUGUST – RAIN 1939
LEVEL
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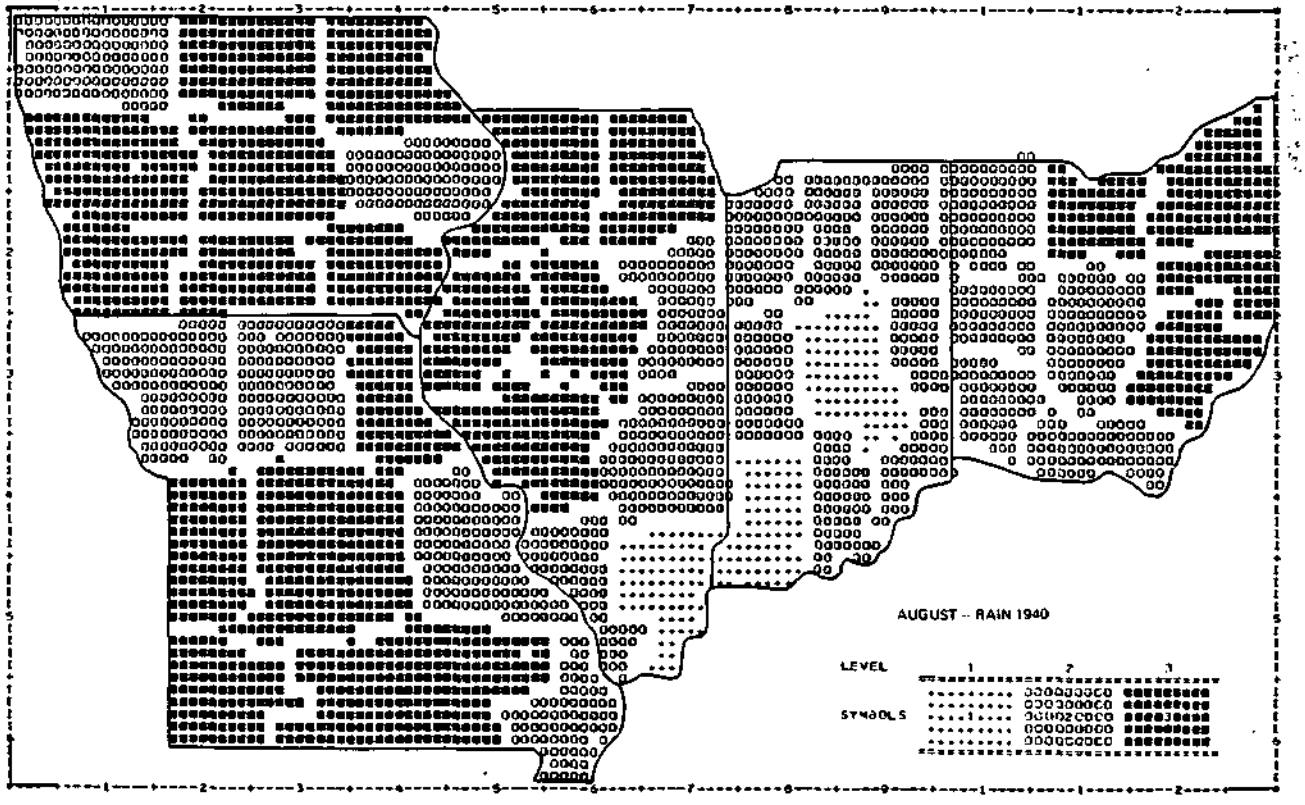
SYMBOLS


AUGUST – RAIN 1940
LEVEL
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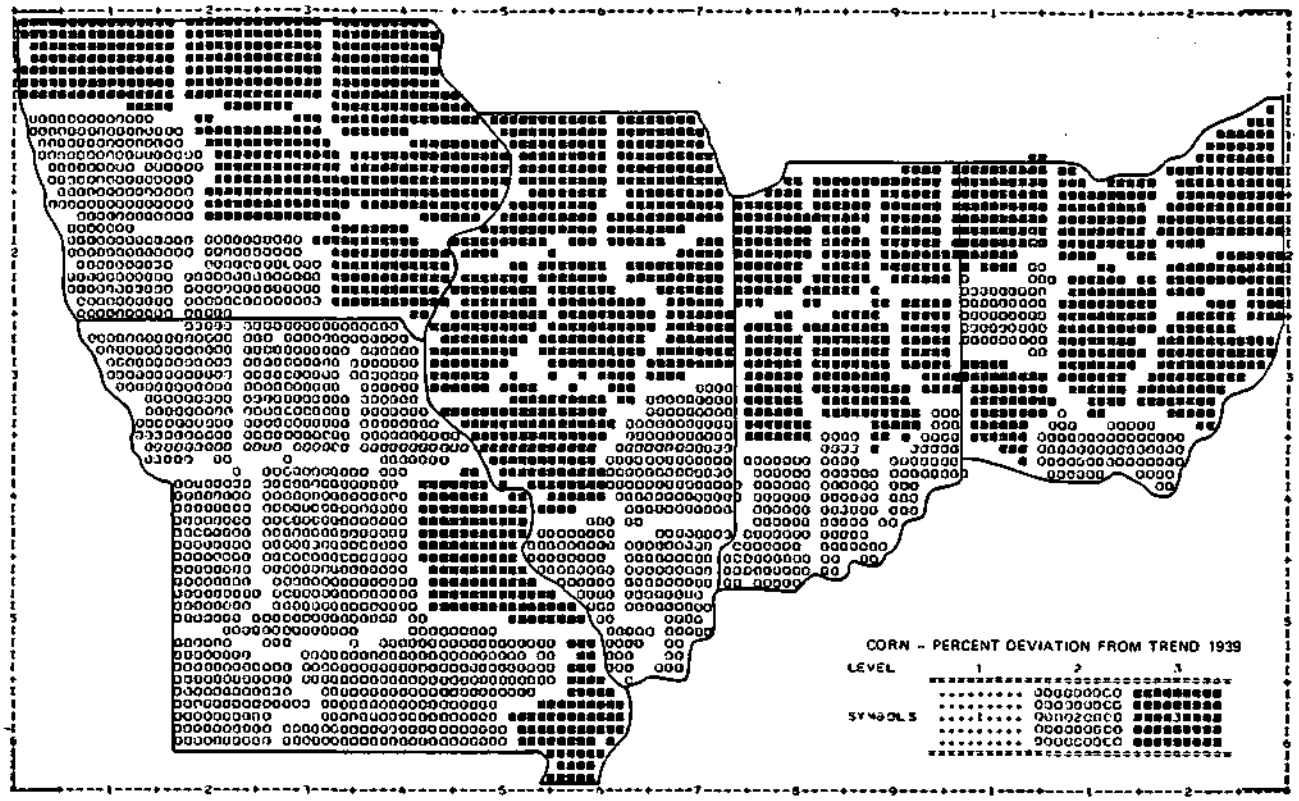
SYMBOLS


CORN - PERCENT DEVIATION FROM TREND 1939
LEVEL
1
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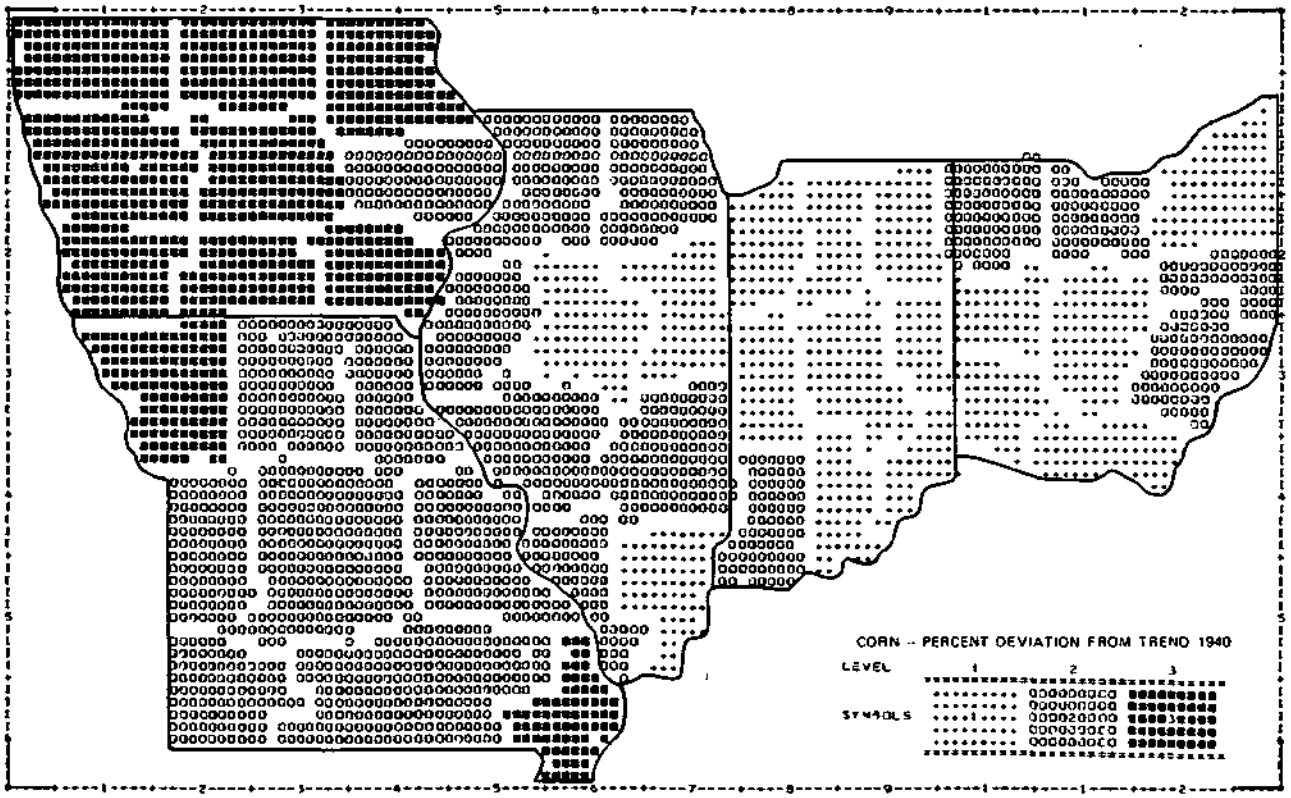
3
SYMBOLS


CORN - PERCENT DEVIATION FROM TREND 1940
LEVEL
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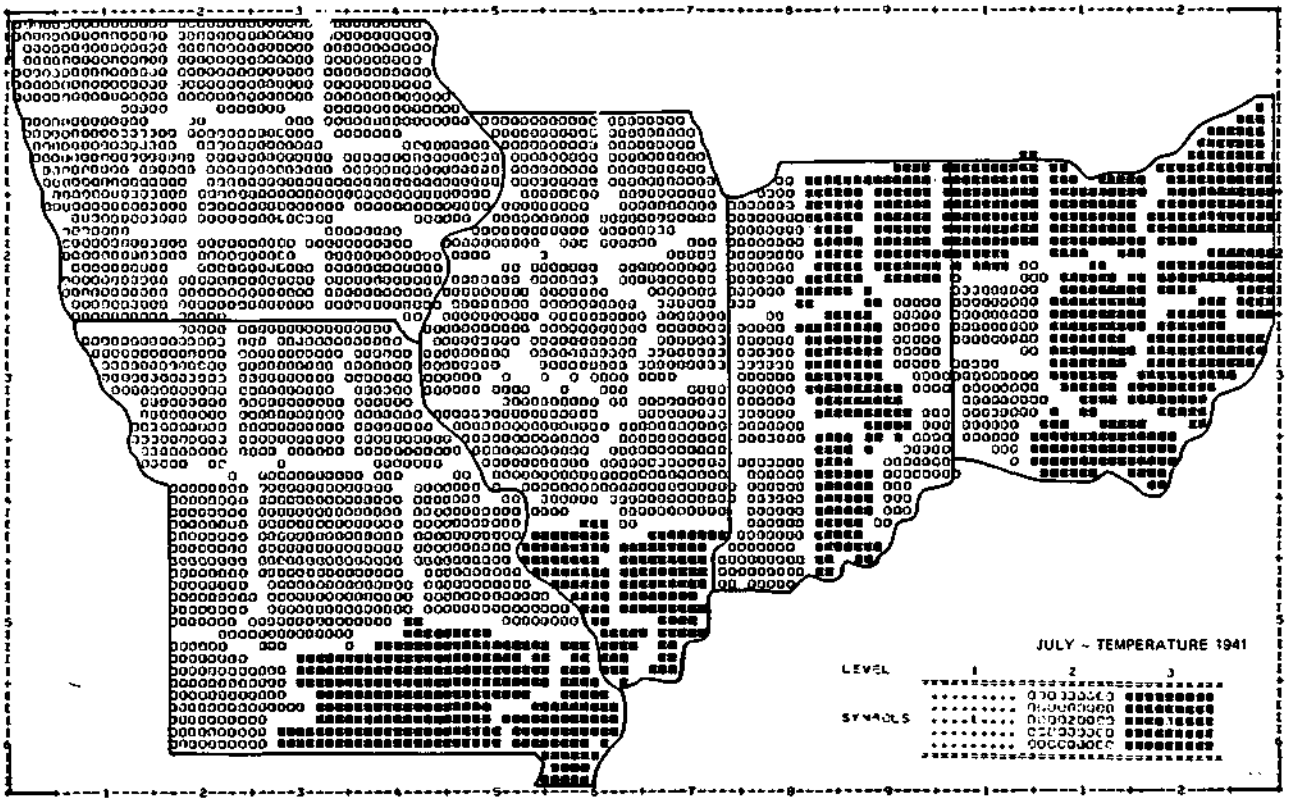
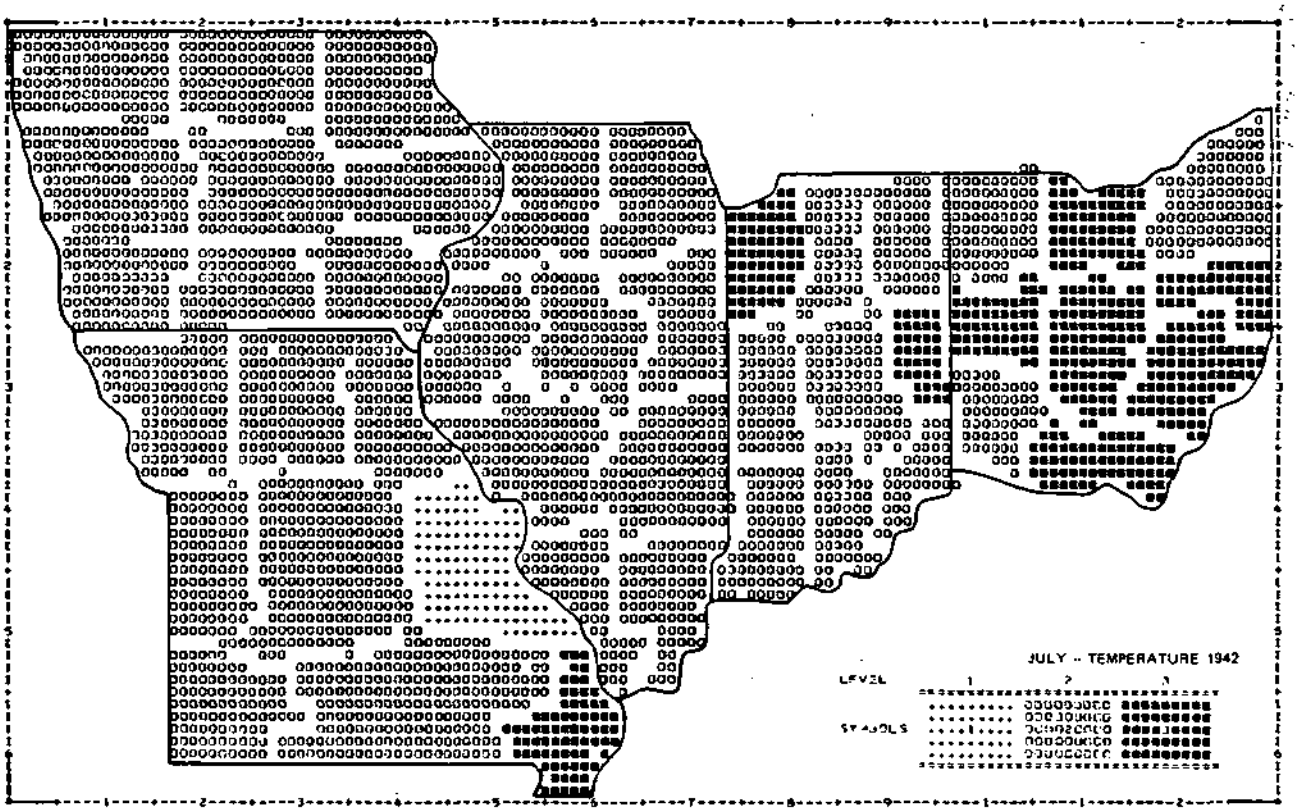
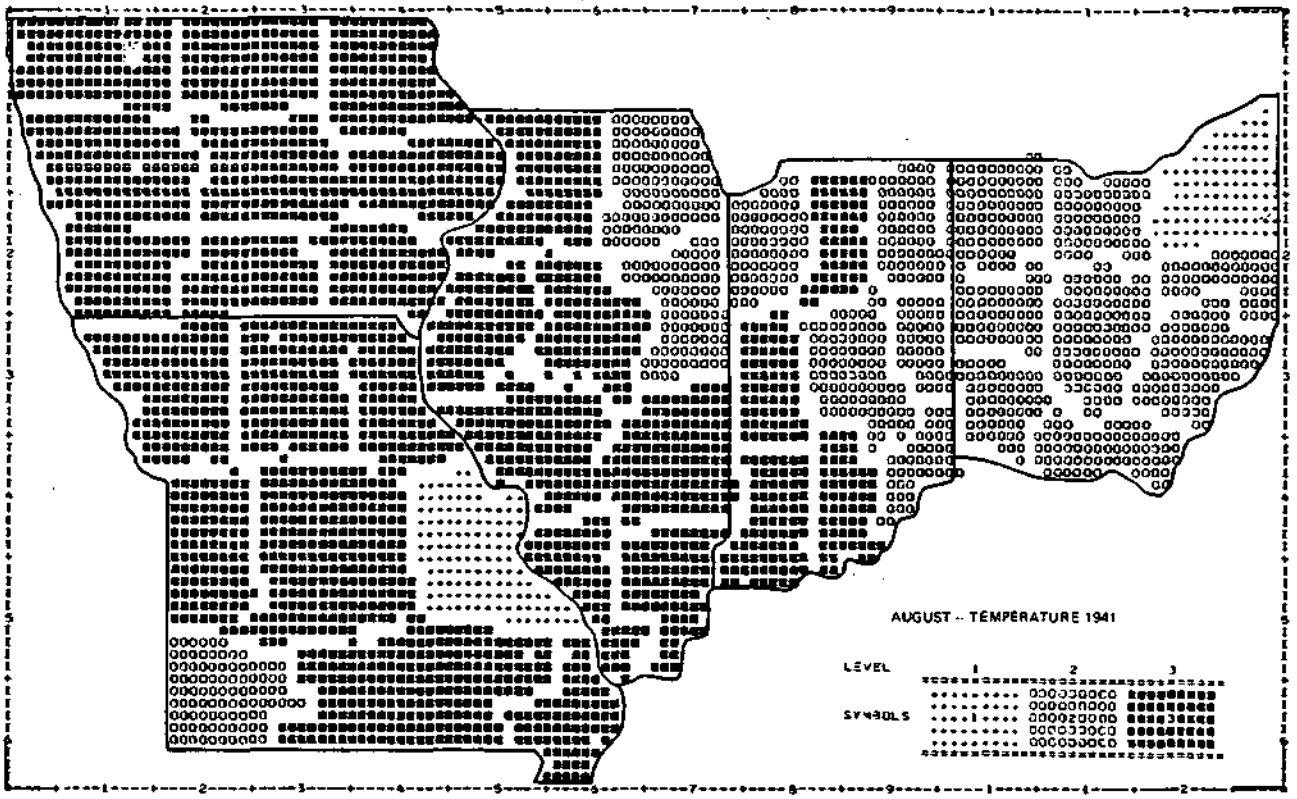
SYMBOLS


JULY - TEMPERATURE 1941
LEVEL
SYMBOLS


JULY - TEMPERATURE 1942
LEVEL
SYMBOLS


AUGUST -- TEMPERATURE 1941
LEVEL
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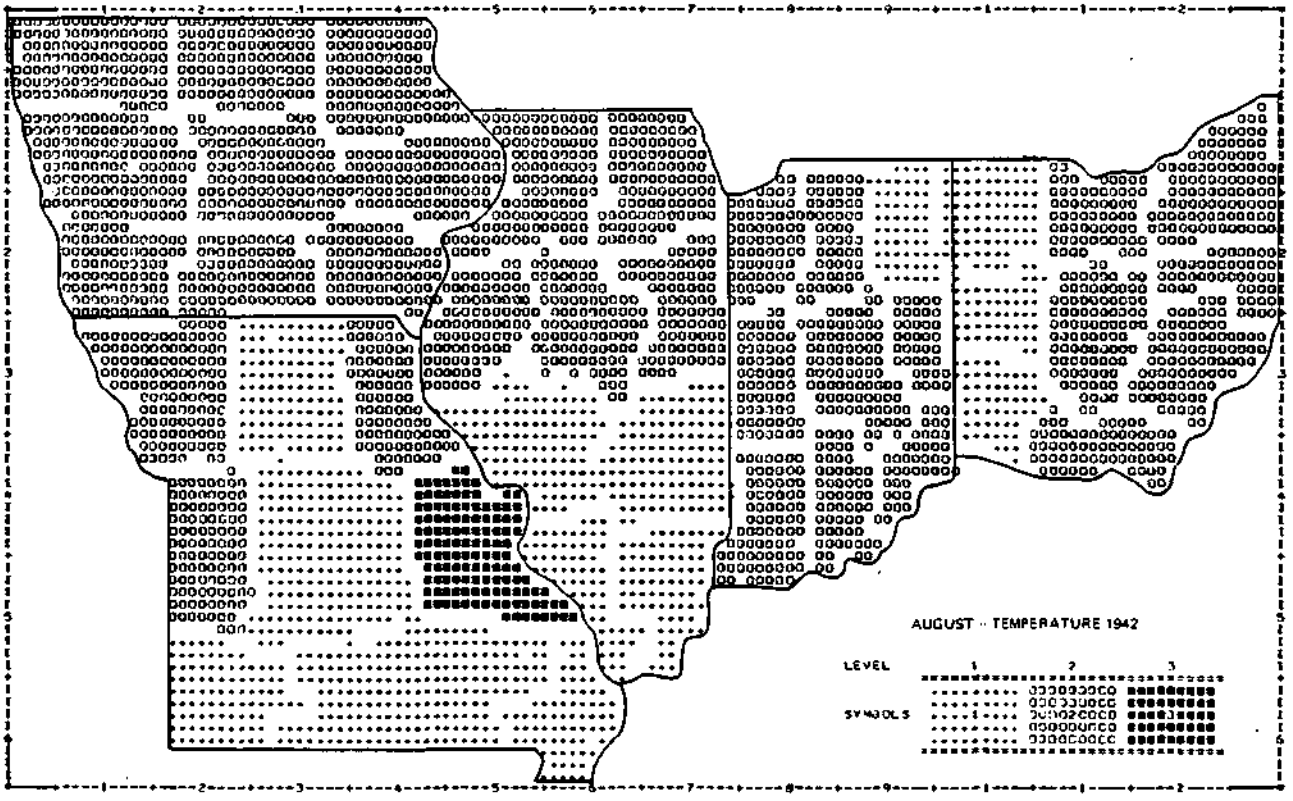
SYMBOLS


AUGUST -- TEMPERATURE 1942
LEVEL
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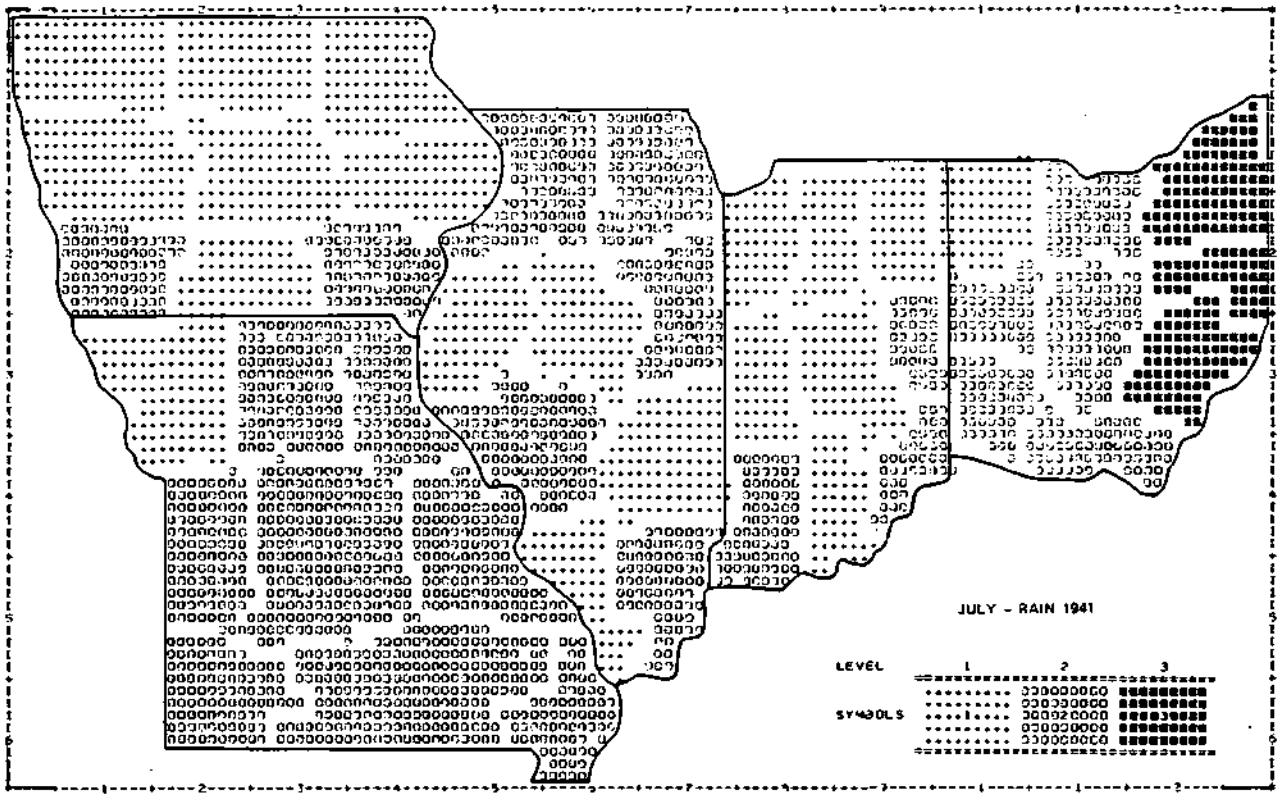
SYMBOLS


JULY - RAIN 1941
LEVEL
1
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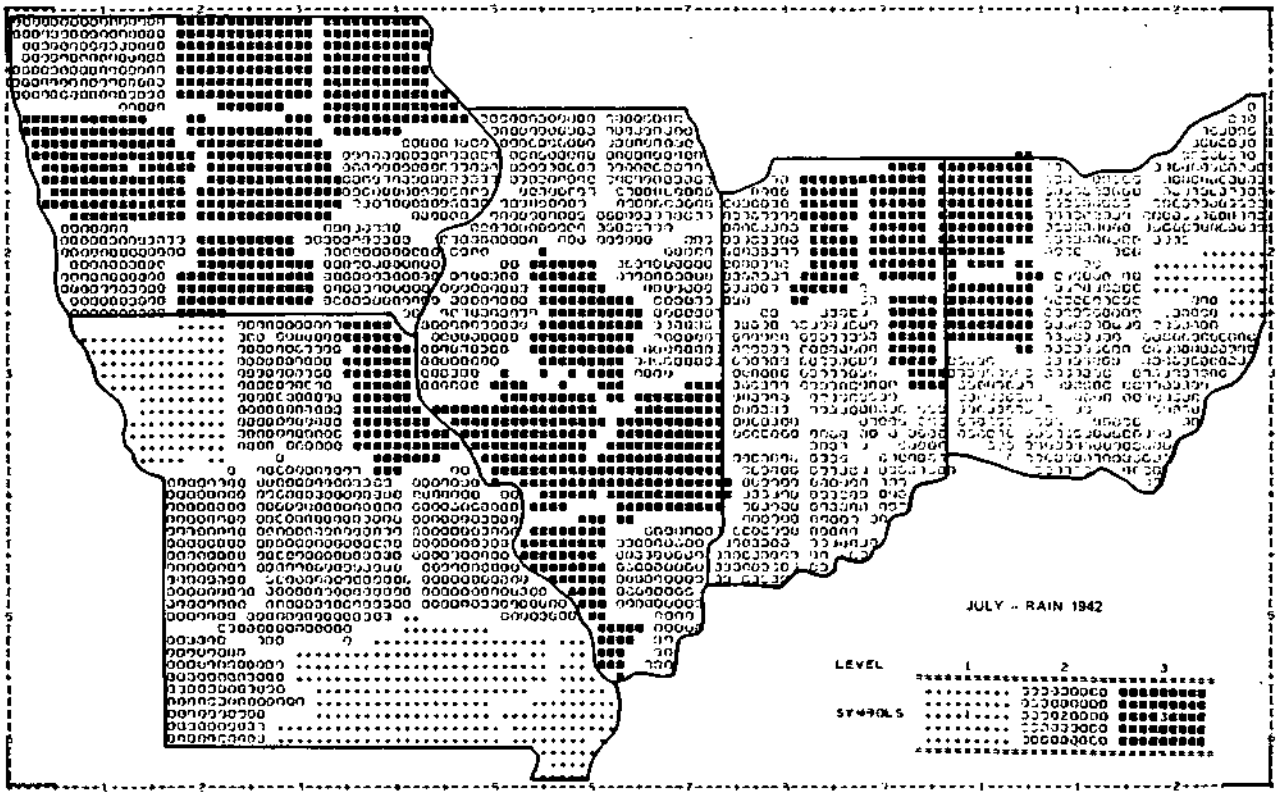
SYMBOLS


JULY - RAIN 1942
LEVEL
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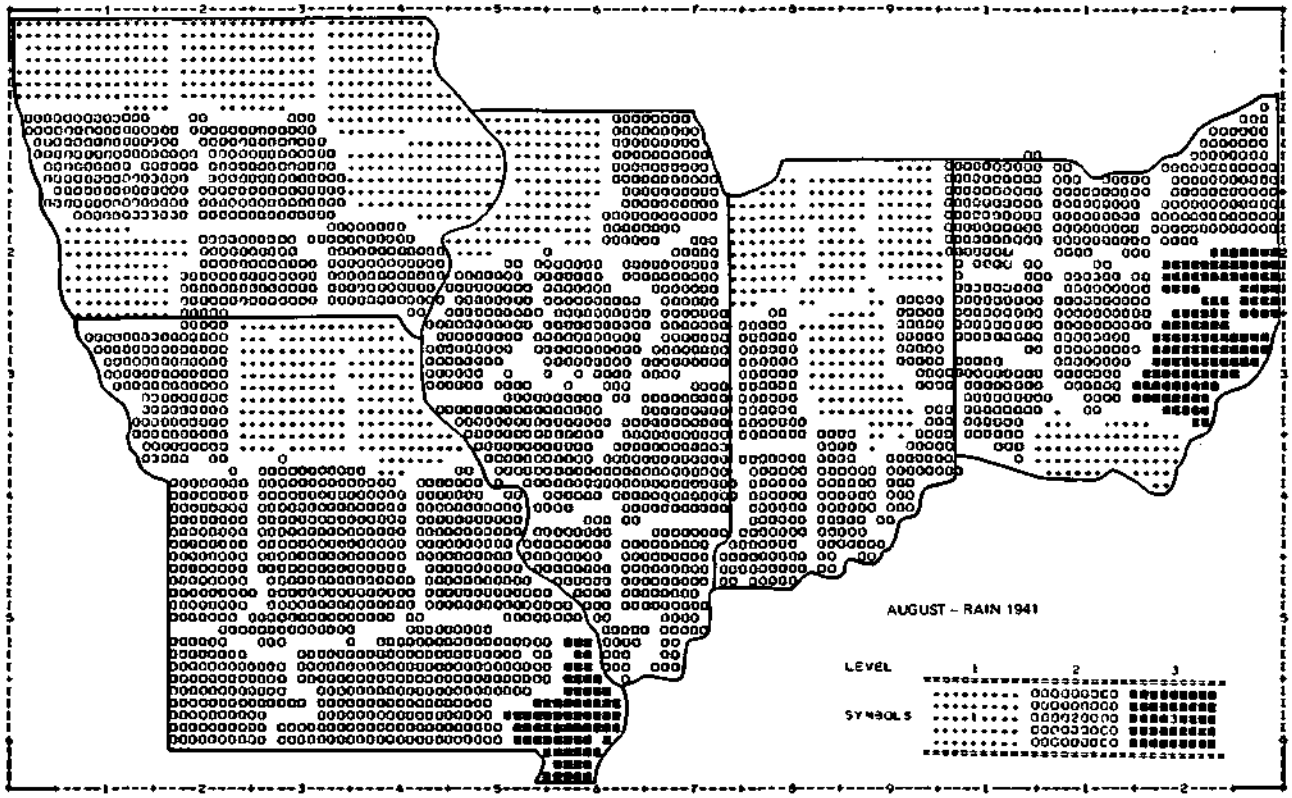
SYMBOLS


AUGUST – RAIN 1941
LEVEL
1
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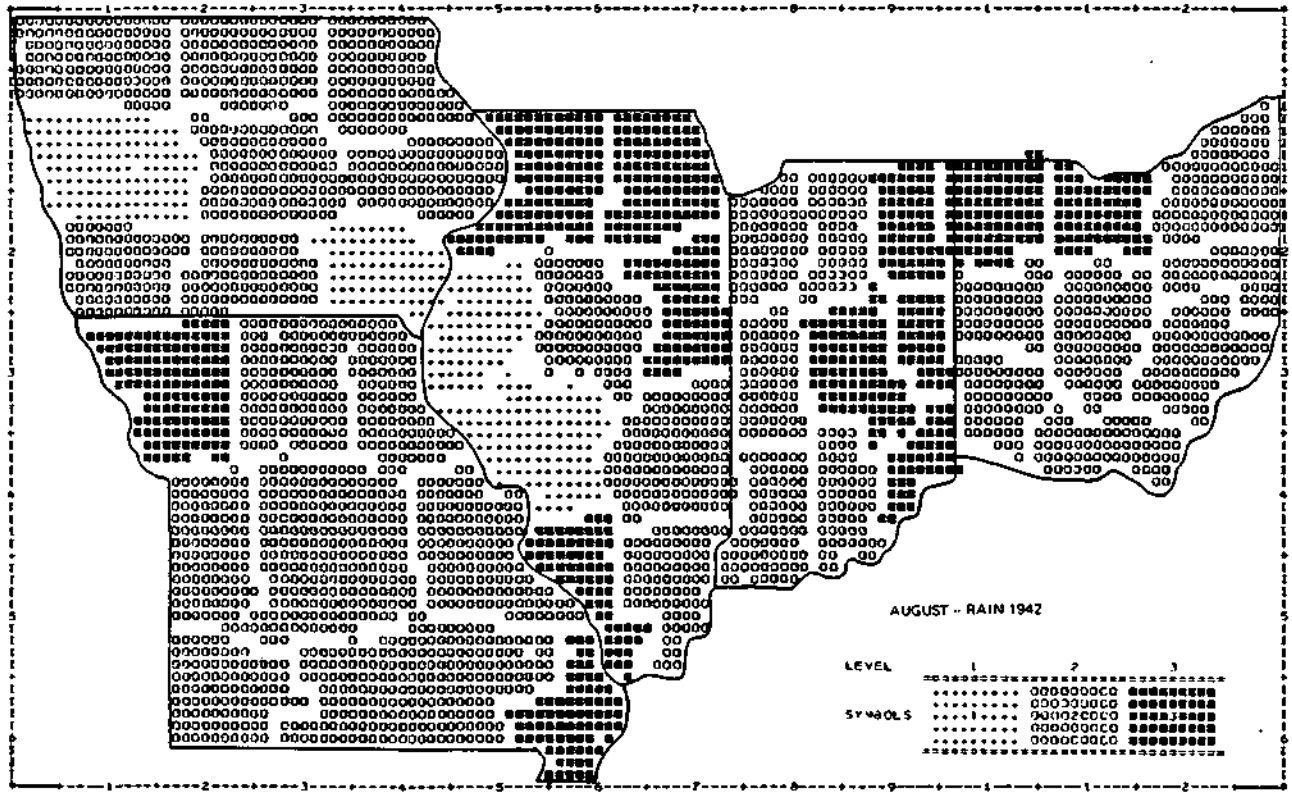
3
SYMBOLS


AUGUST – RAIN 1942
LEVEL
1
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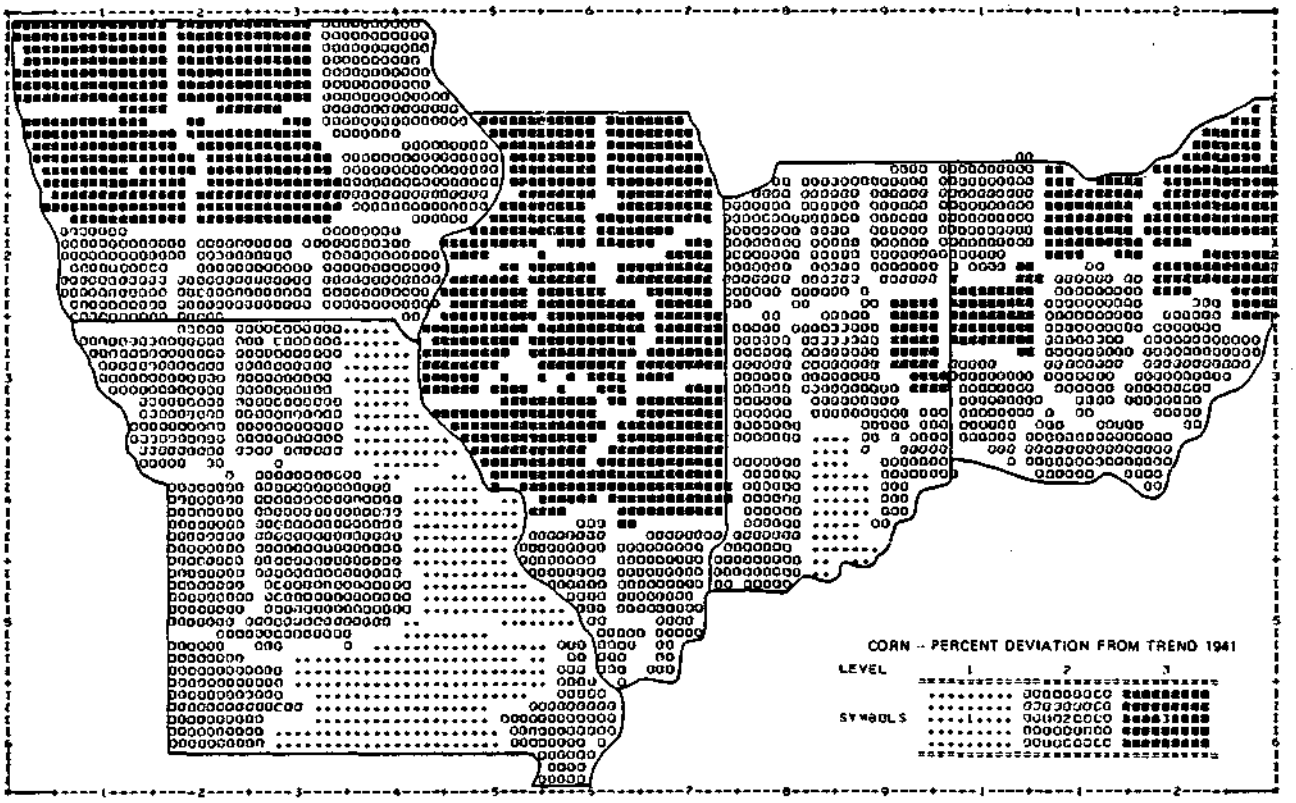
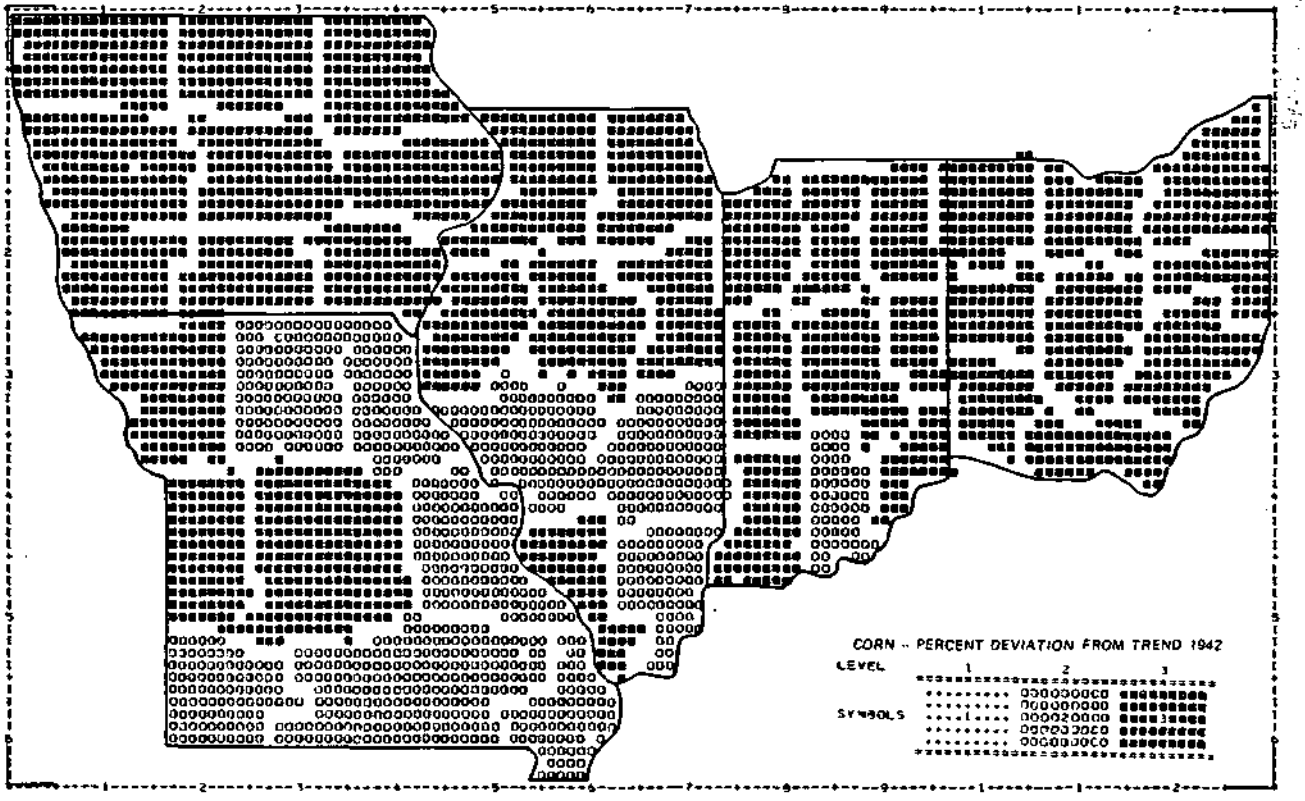
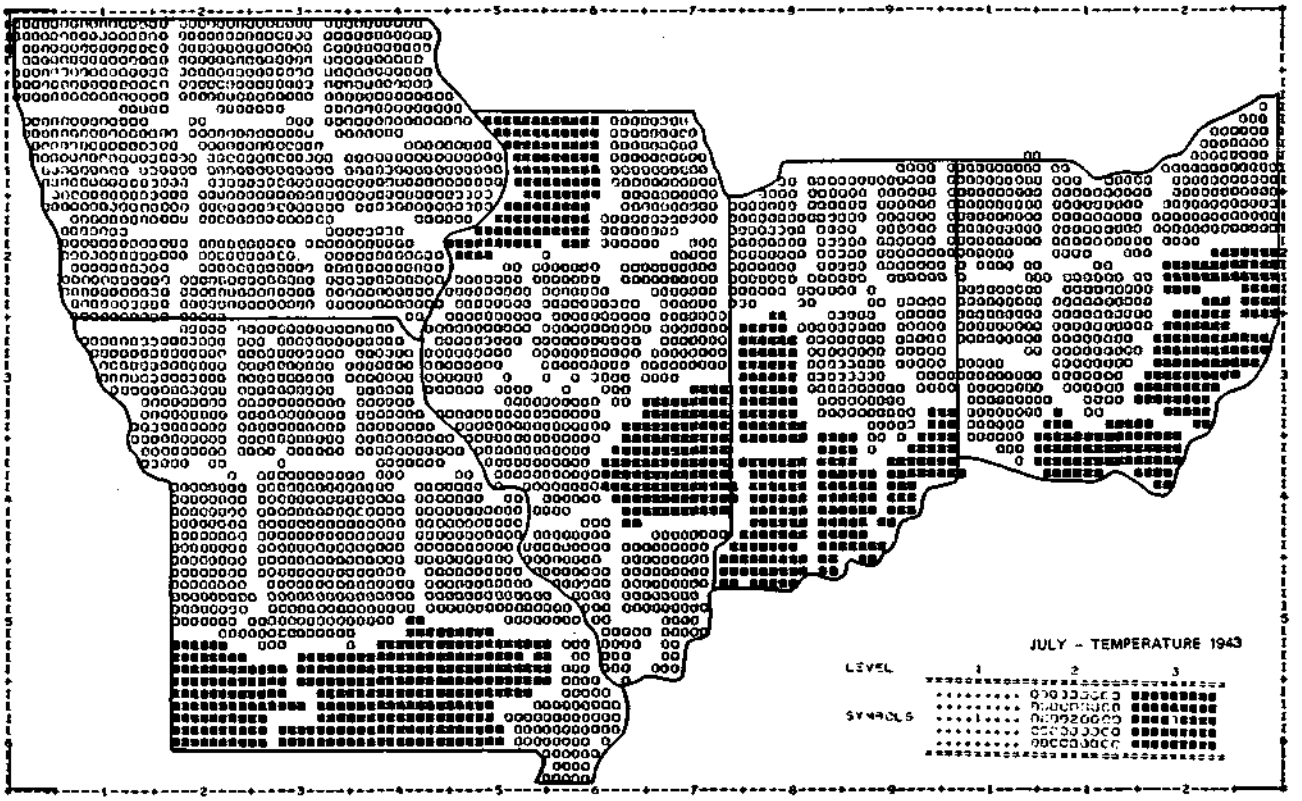
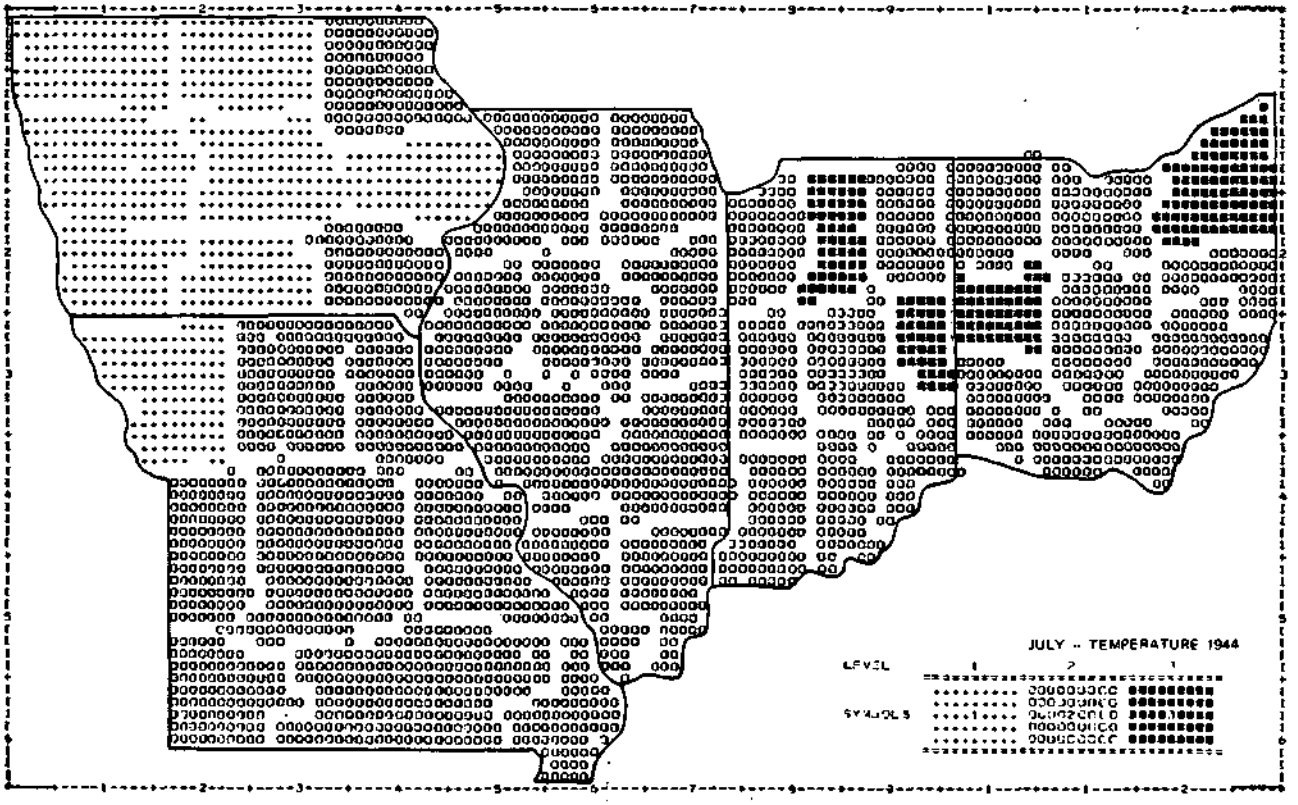
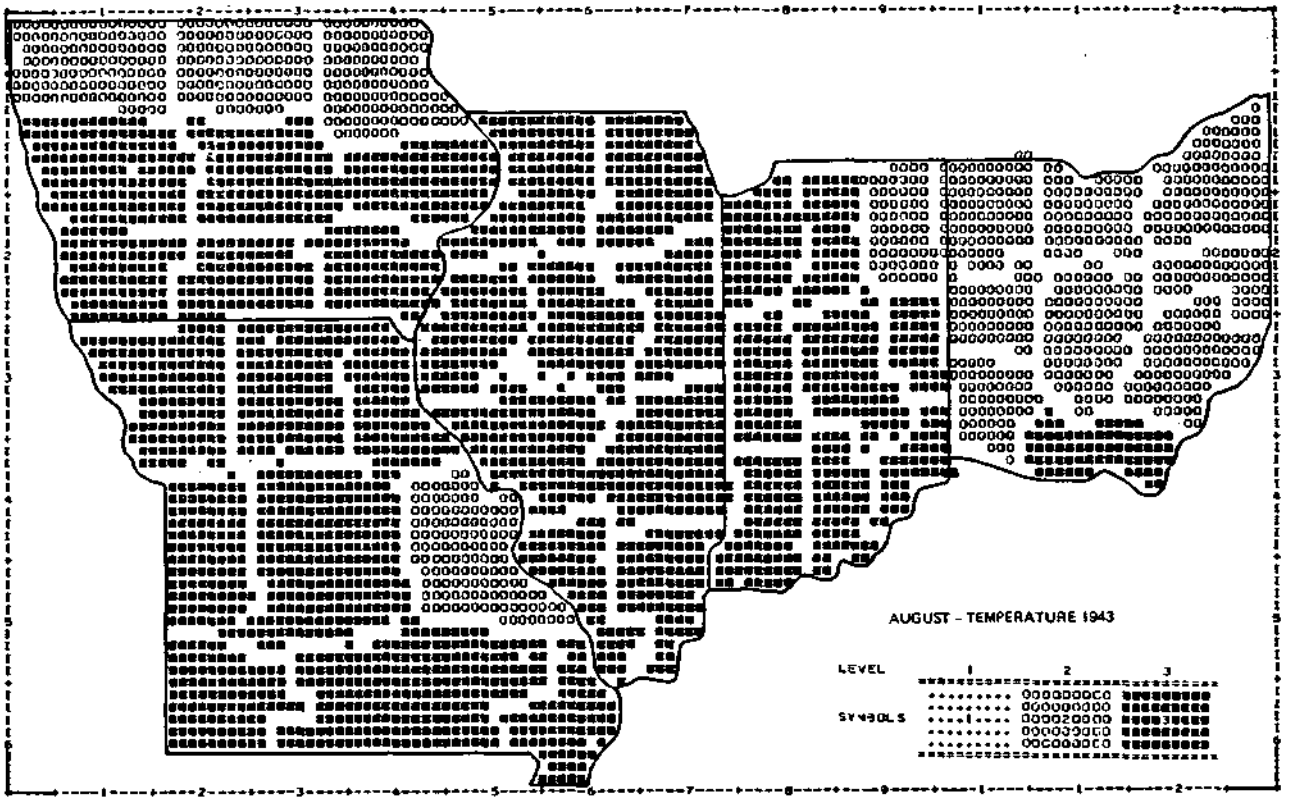
3
SYMBOLS


CORN -- PERCENT DEVIATION FROM TREND 1941
LEVEL
1
2
3
SYMBOLS


CORN -- PERCENT DEVIATION FROM TREND 1942
LEVEL
1
2
3
SYMBOLS


JULY - TEMPERATURE 1943
LEVEL
SYMBOLS


JULY - TEMPERATURE 1944
LEVEL
SYMBOLS


AUGUST - TEMPERATURE 1943
LEVEL
1
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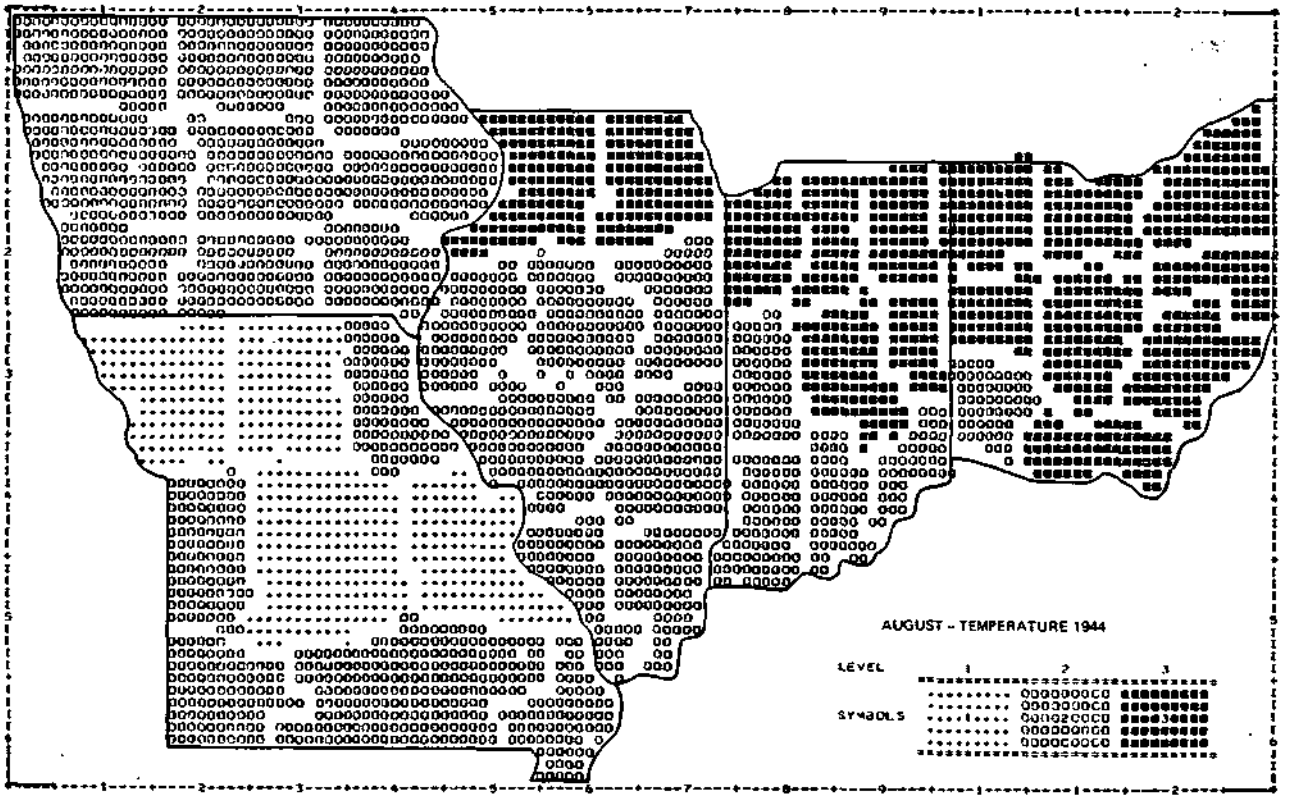
3
SYMBOLS


AUGUST - TEMPERATURE 1944
LEVEL
1
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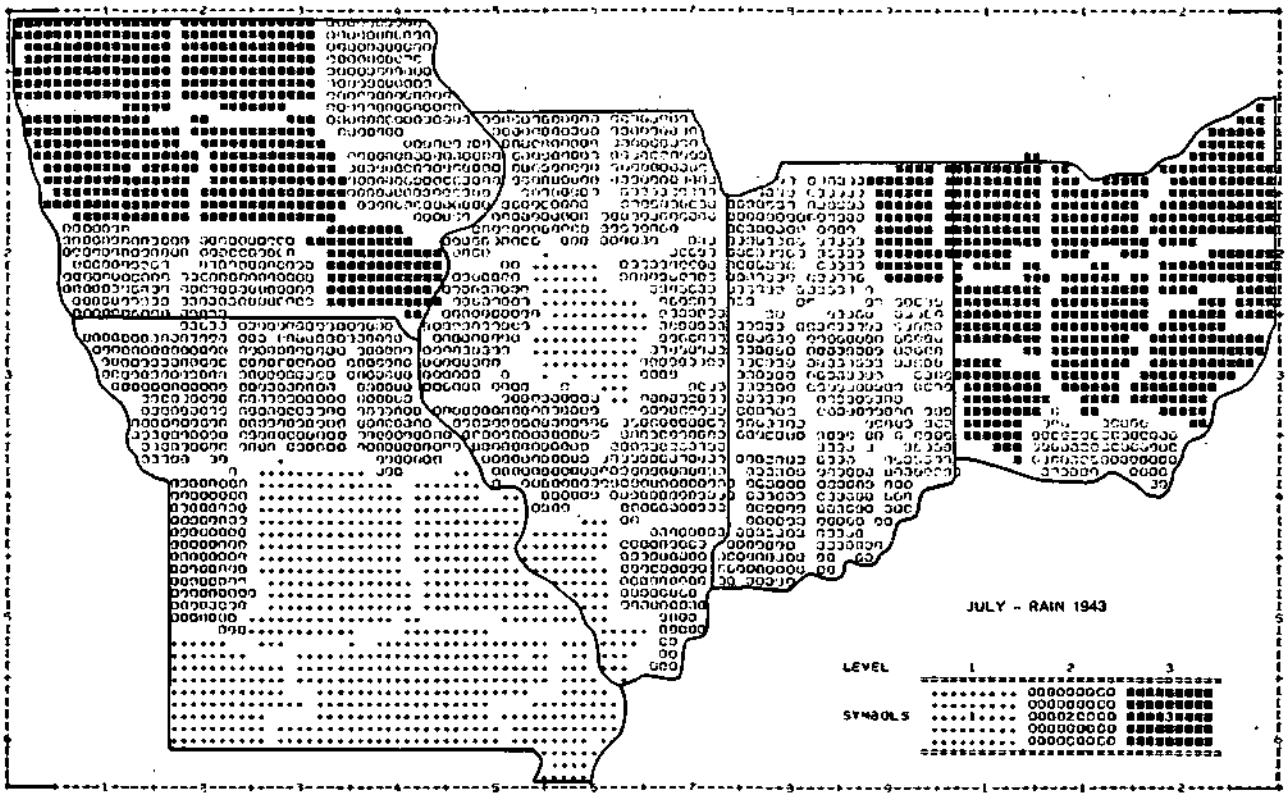
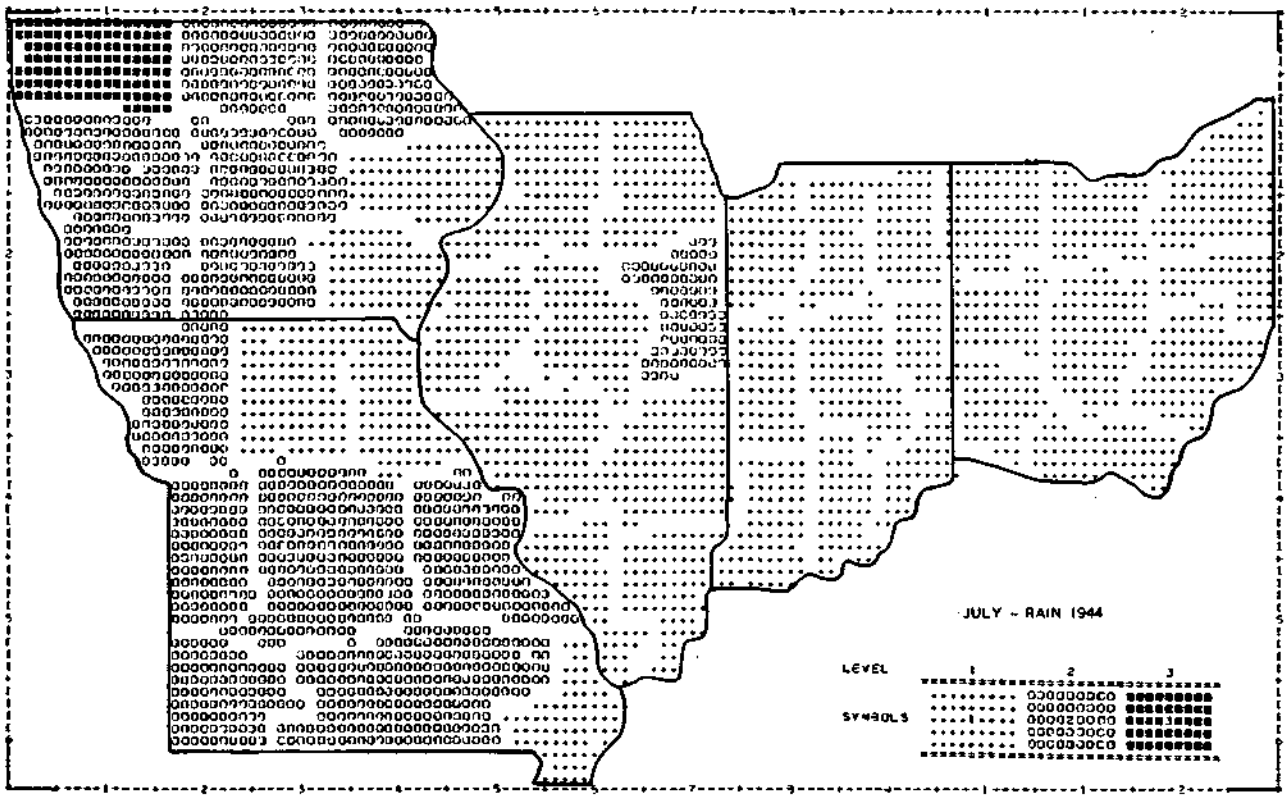
SYMBOLS


JULY - RAIN 1943
LEVEL
1
2
3
SYMBOLS


JULY - RAIN 1944
LEVEL
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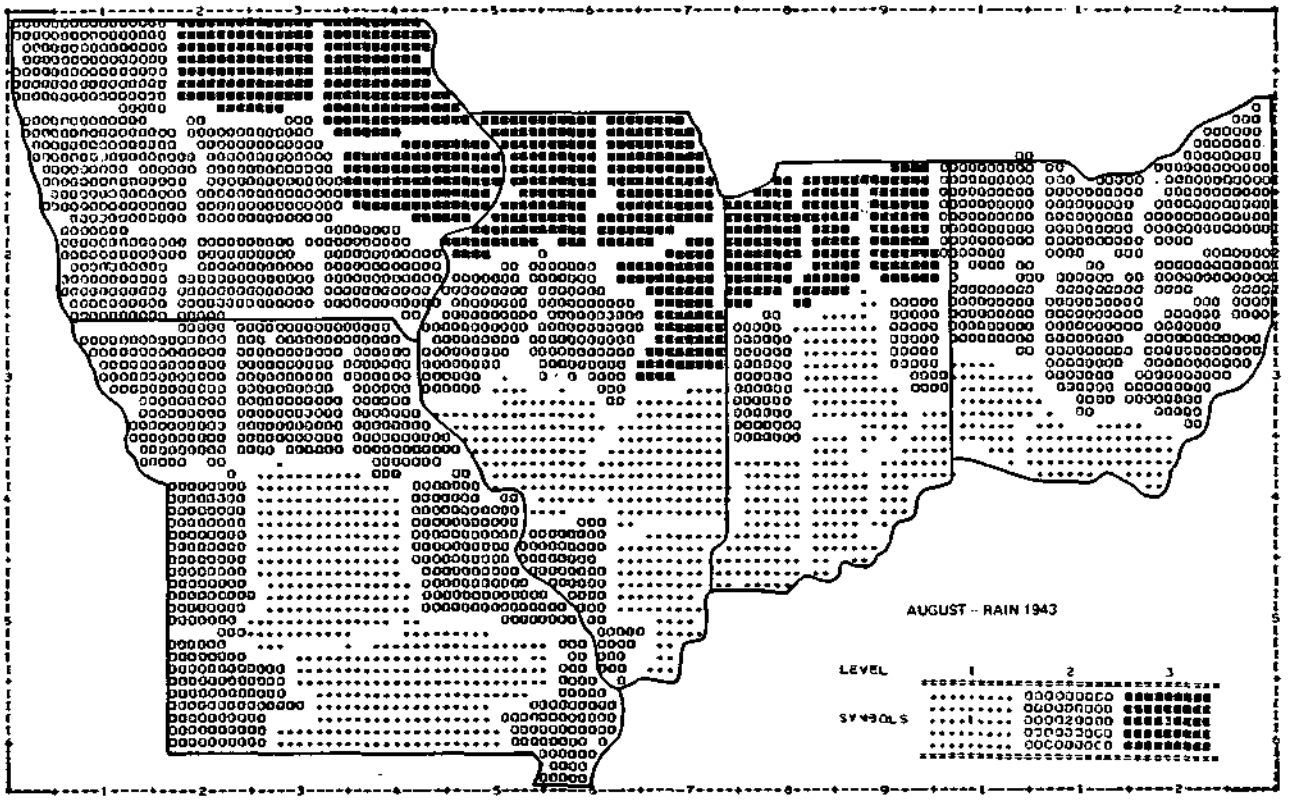
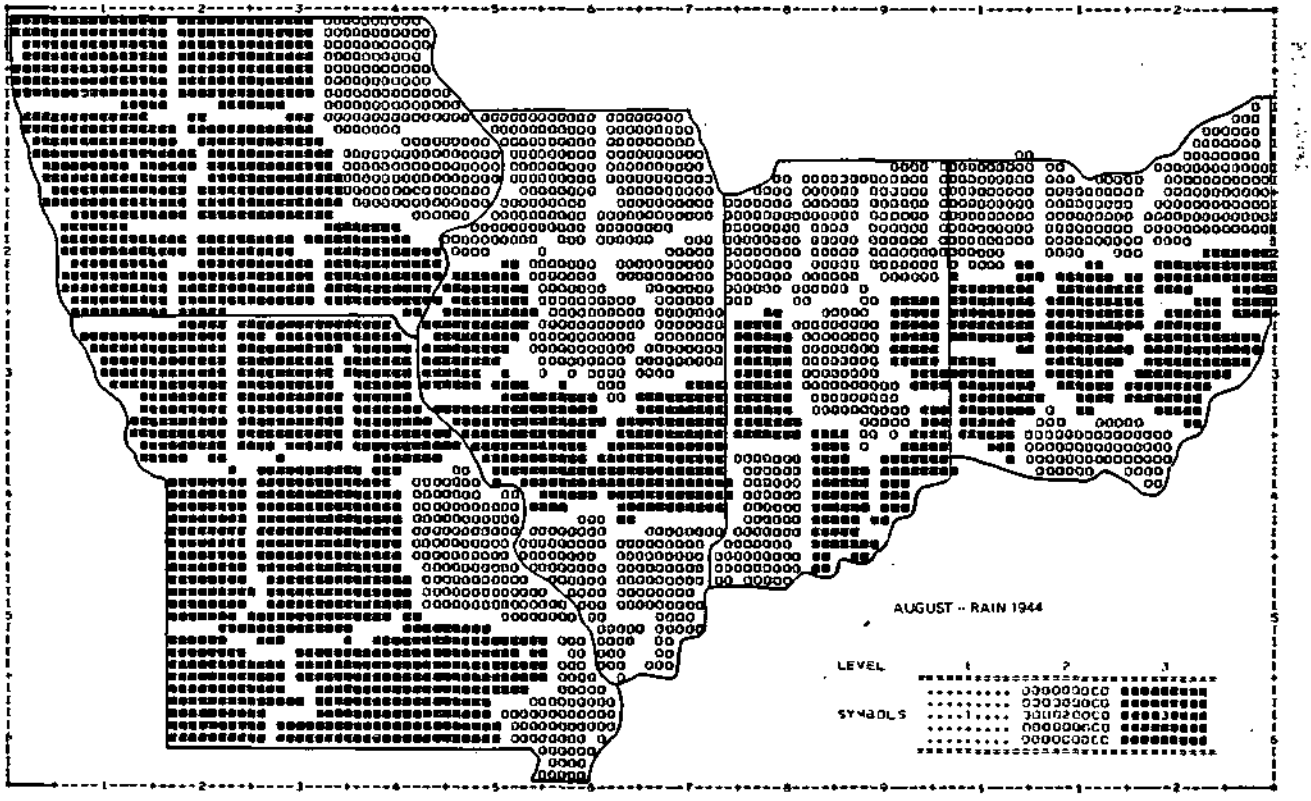
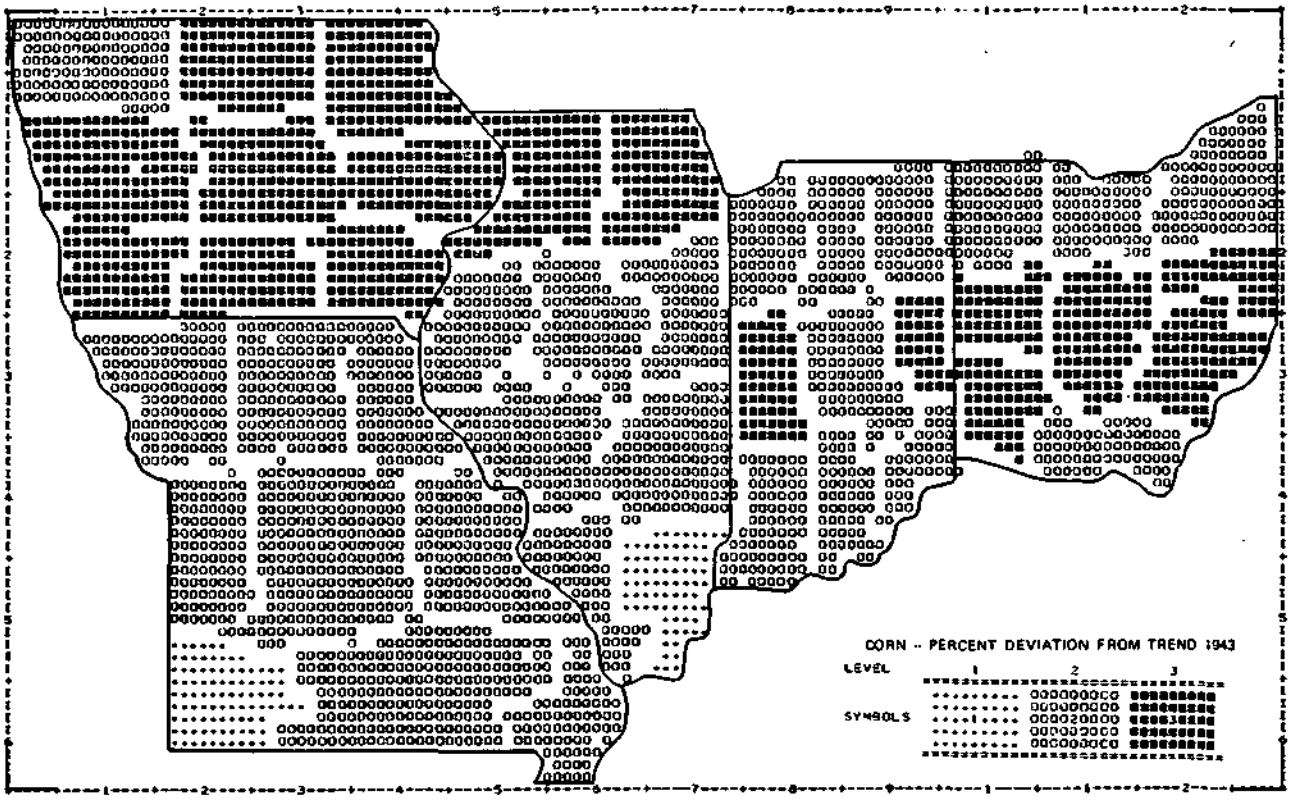
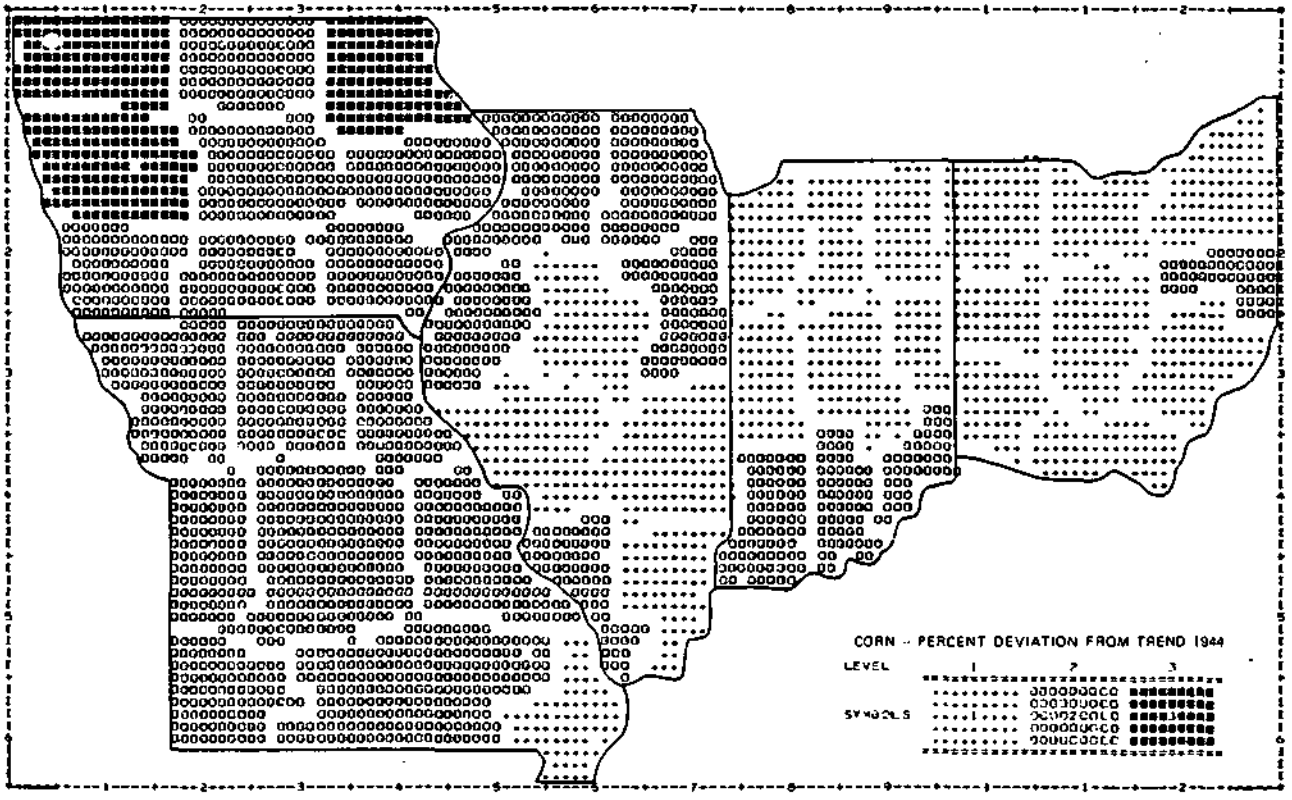
SYMBOLS


AUGUST -- RAIN 1943
LEVEL
SYMBOLS


AUGUST -- RAIN 1944
LEVEL
SYMBOLS


CORN -- PERCENT DEVIATION FROM TREND 1943
LEVEL
1
2
3
SYMBOLS


CORN -- PERCENT DEVIATION FROM TREND 1944
LEVEL
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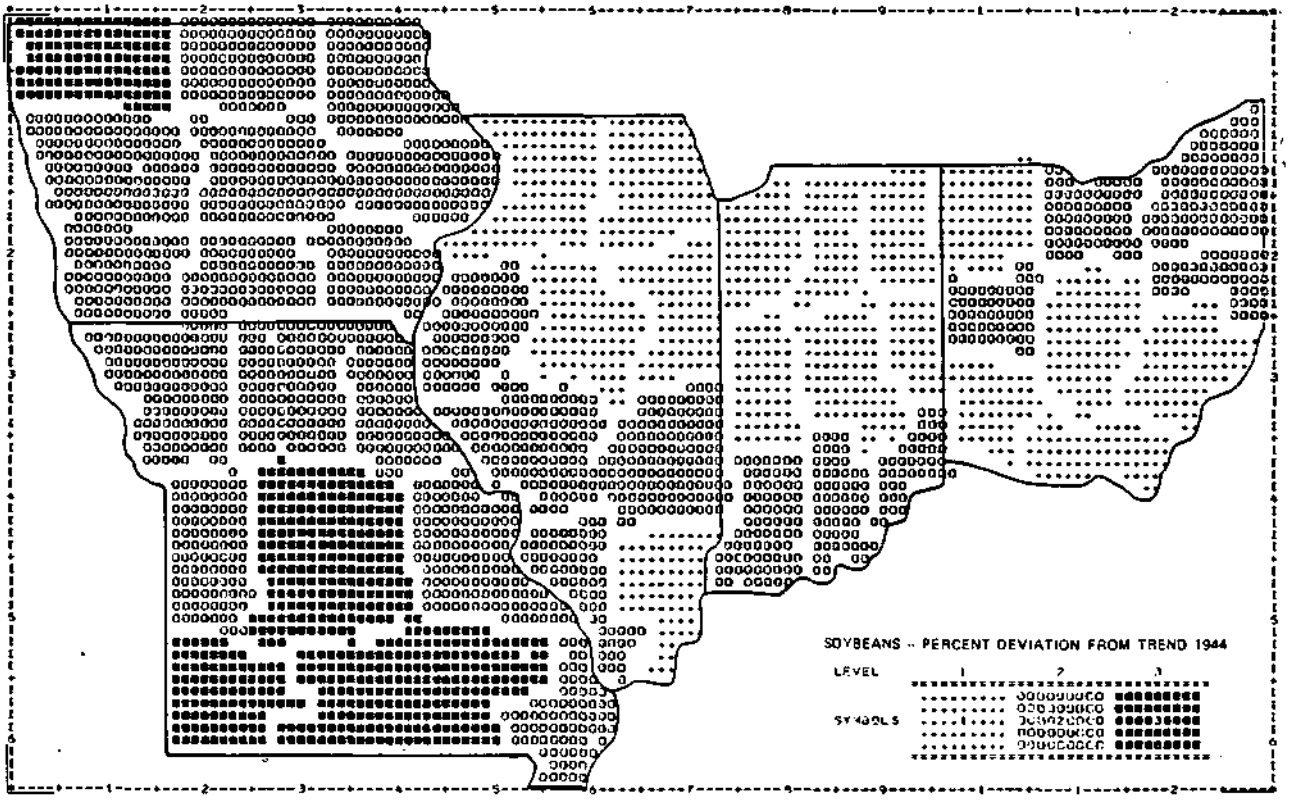
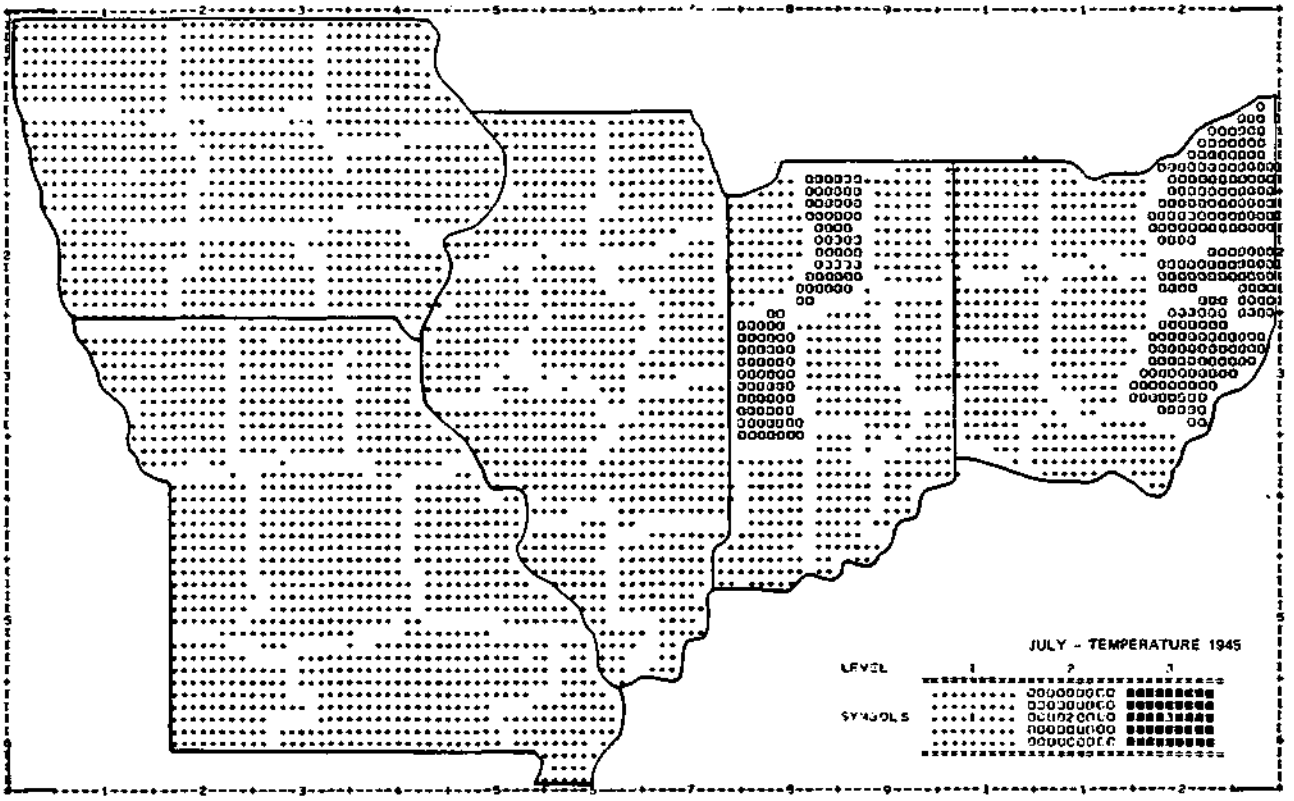
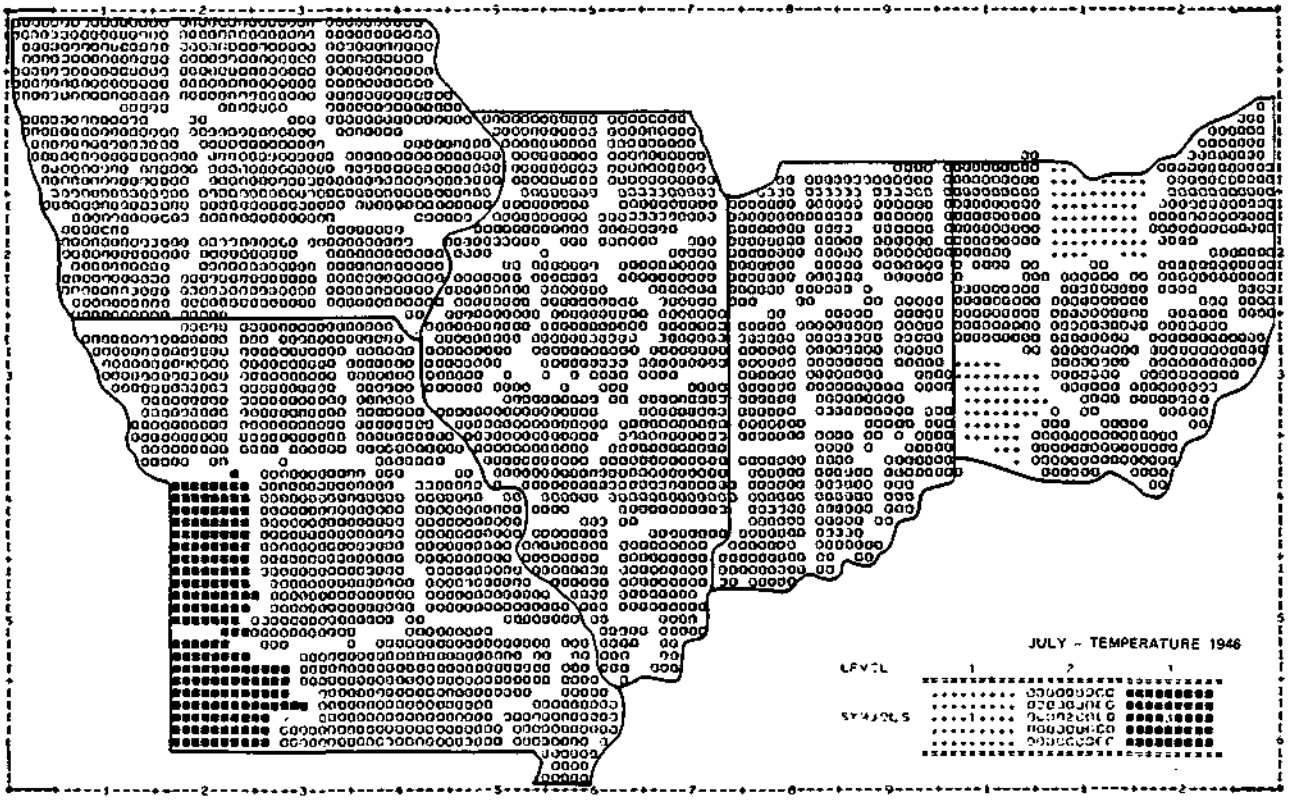
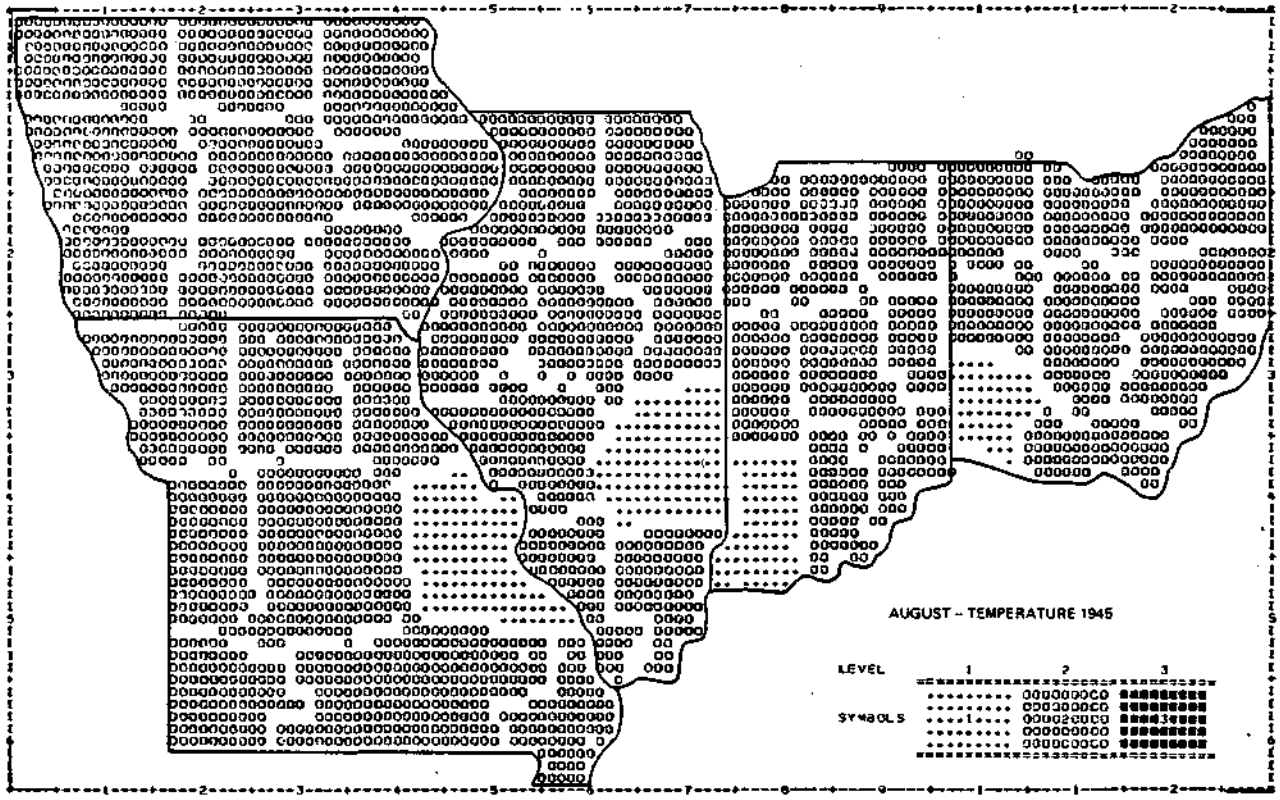
3
SYMBOLS


SOYBEANS -- PERCENT DEVIATION FROM TREND 1944
LEVEL
1
2
3


JULY - TEMPERATURE 1945
LEVEL
SYMBOLS


JULY - TEMPERATURE 1946
LEVEL
SYMBOLS


AUGUST -- TEMPERATURE 1945
LEVEL
1
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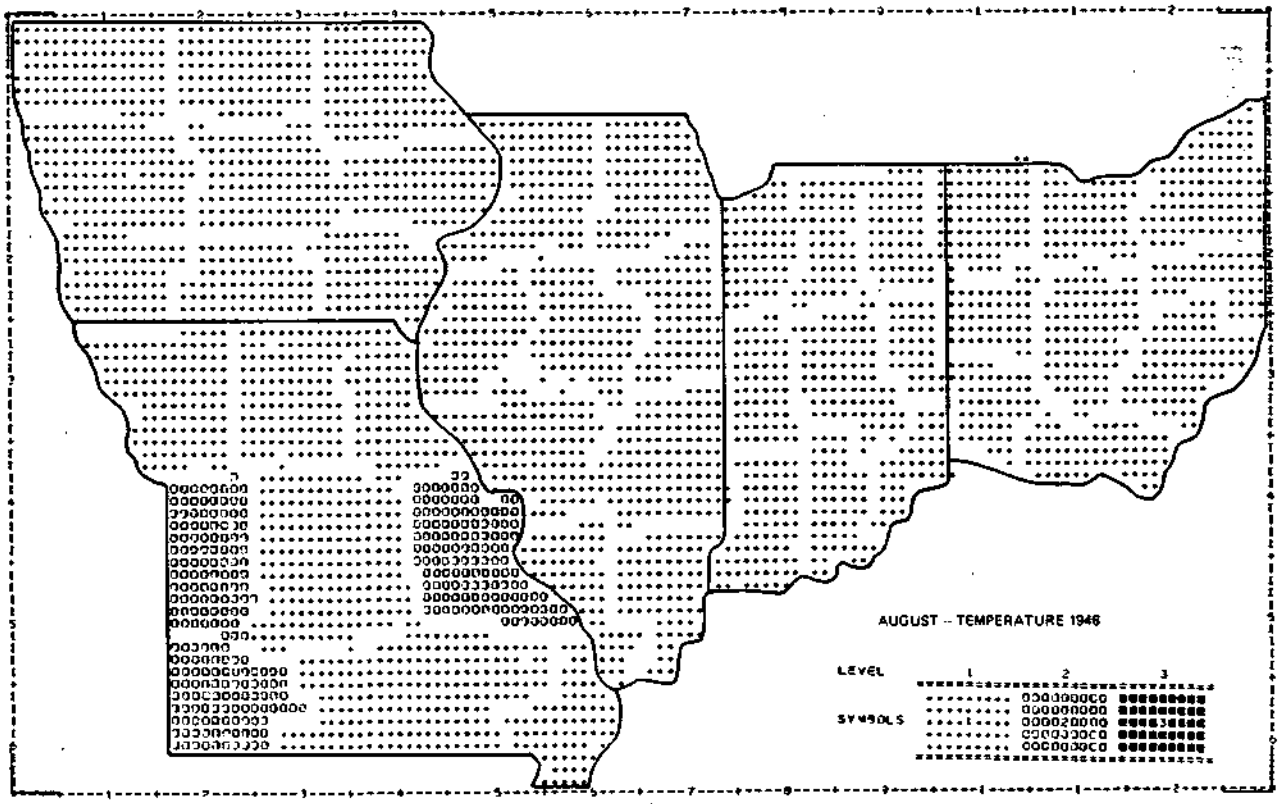
3
SYMBOLS


AUGUST -- TEMPERATURE 1946
LEVEL
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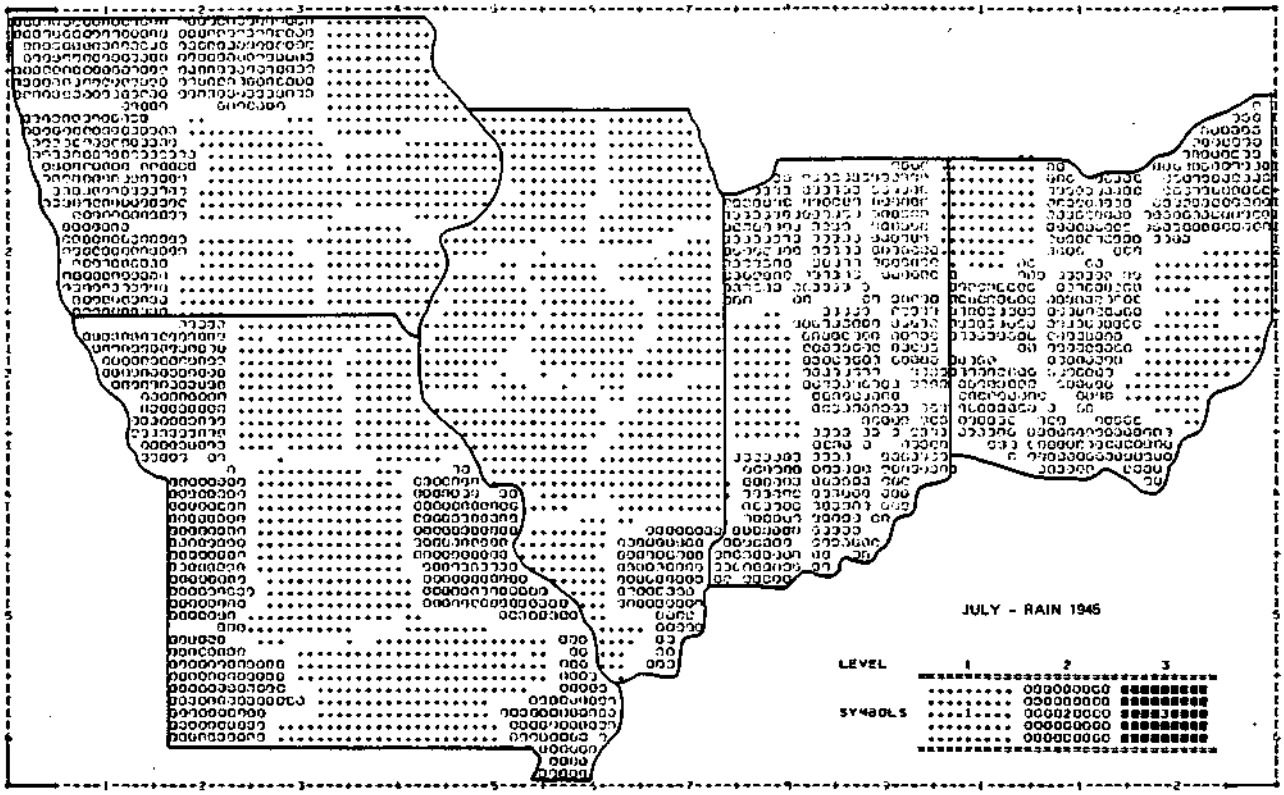
3
SYMBOLS


JULY - RAIN 1945
LEVEL
1
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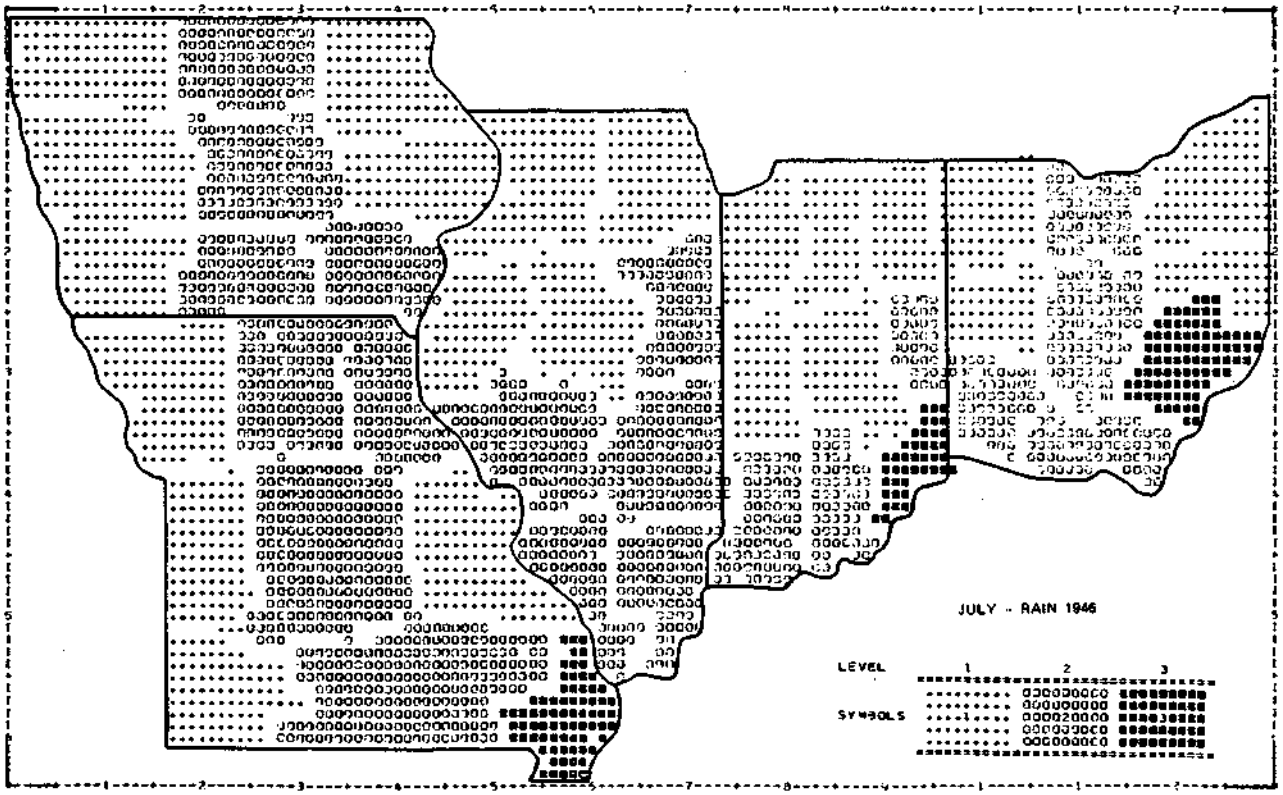
3
SYMBOLS


JULY - RAIN 1946
LEVEL
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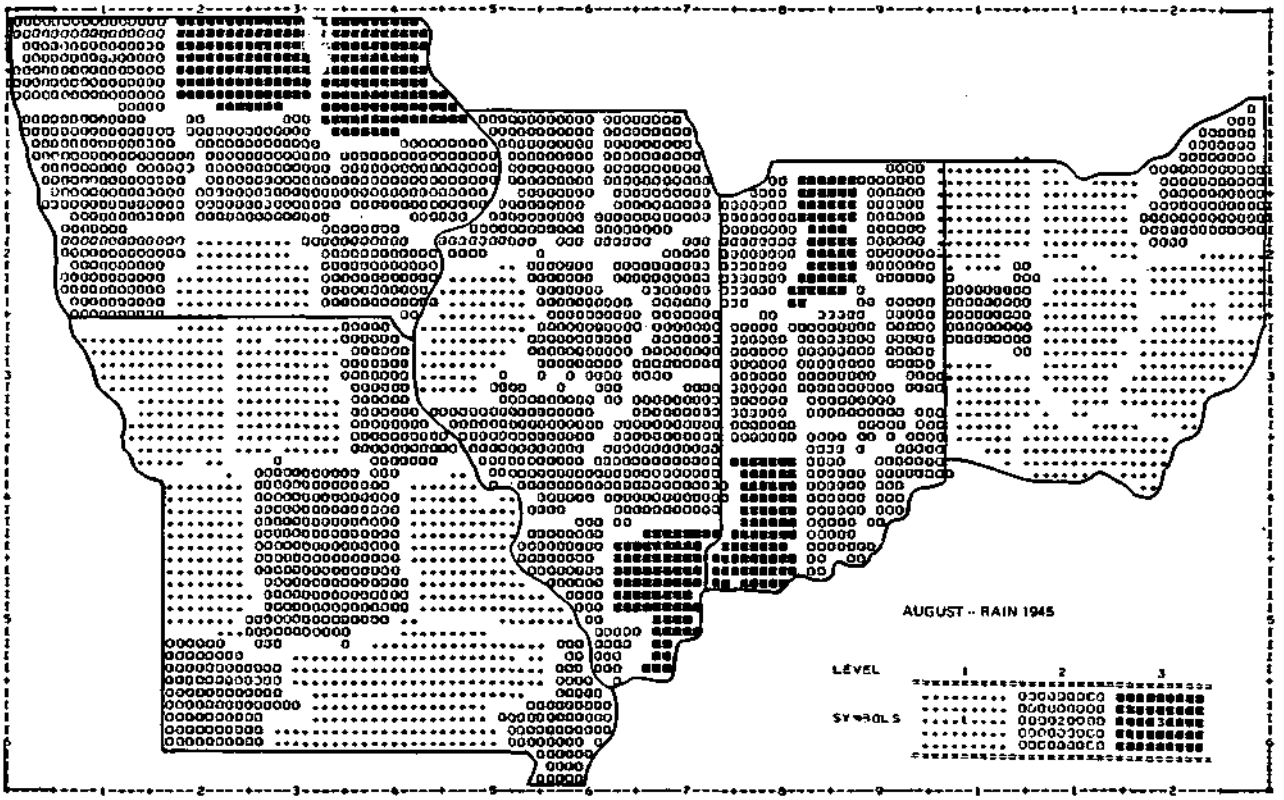
SYMBOLS


AUGUST -- RAIN 1945
LEVEL
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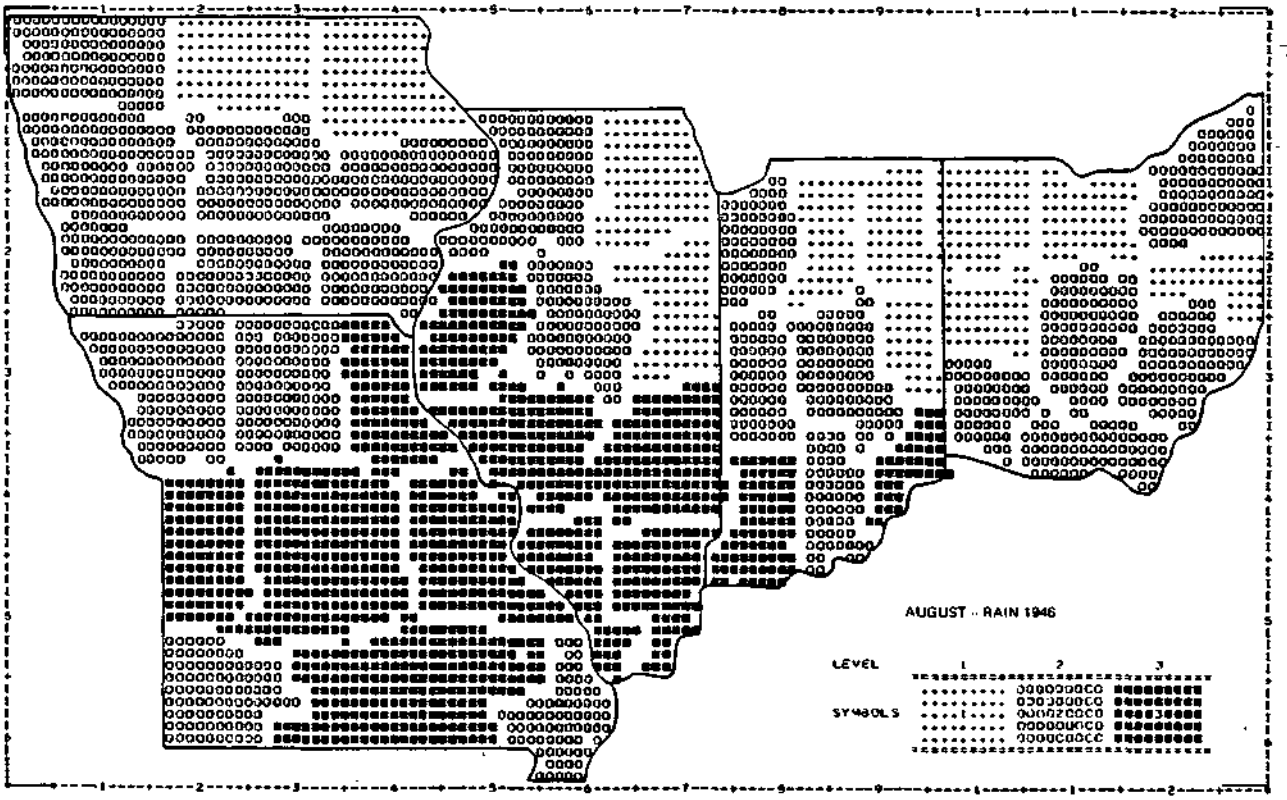
SYMBOLS


AUGUST -- RAIN 1946
LEVEL
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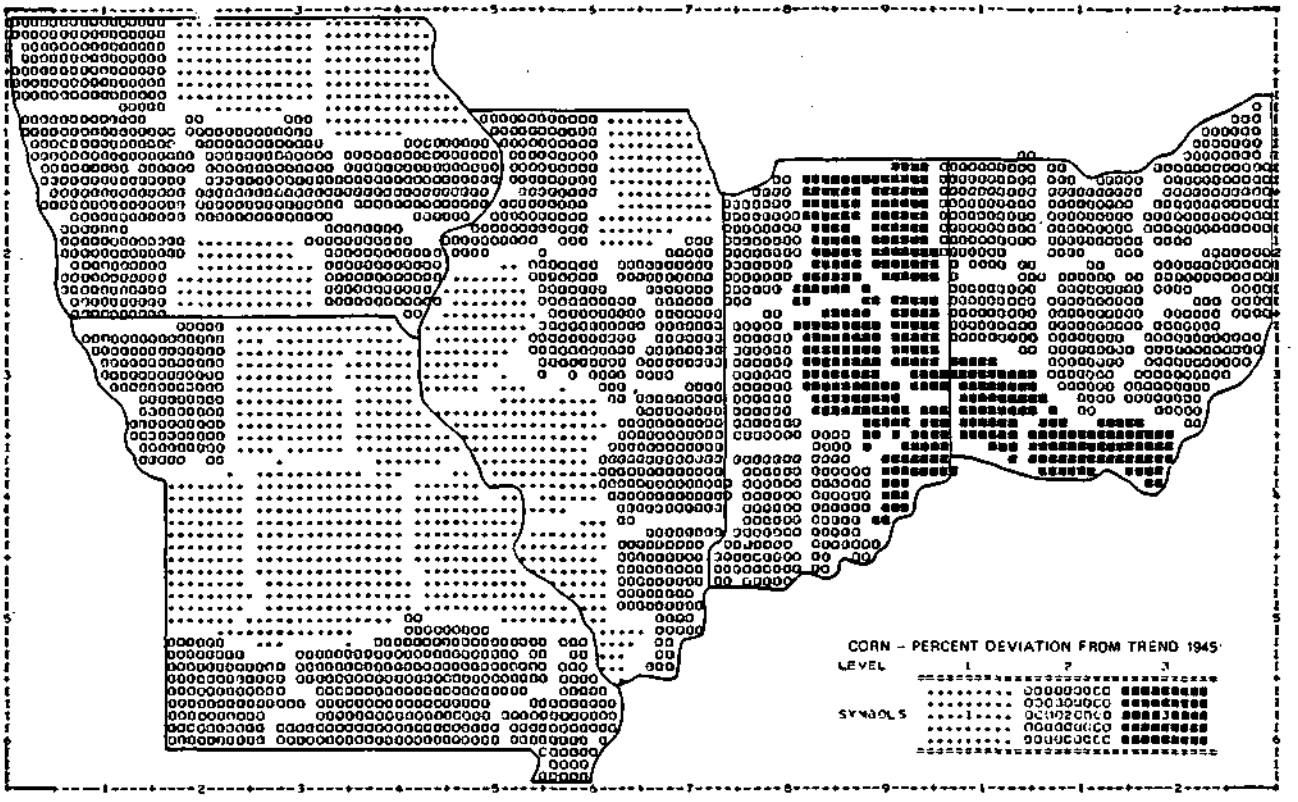
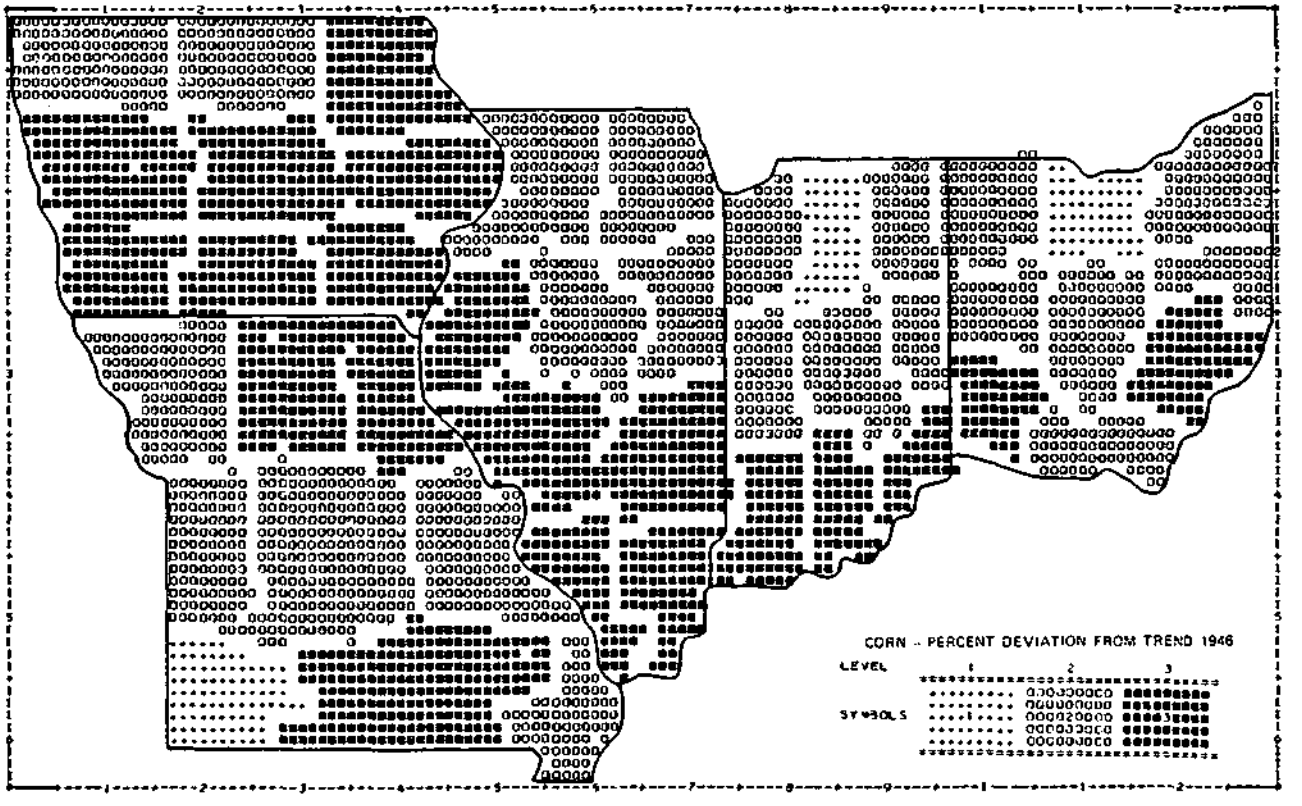
SYMBOLS


CORN – PERCENT DEVIATION FROM TREND 1945
LEVEL
1
2
3
SYMBOLS


CORN – PERCENT DEVIATION FROM TREND 1946
LEVEL
1
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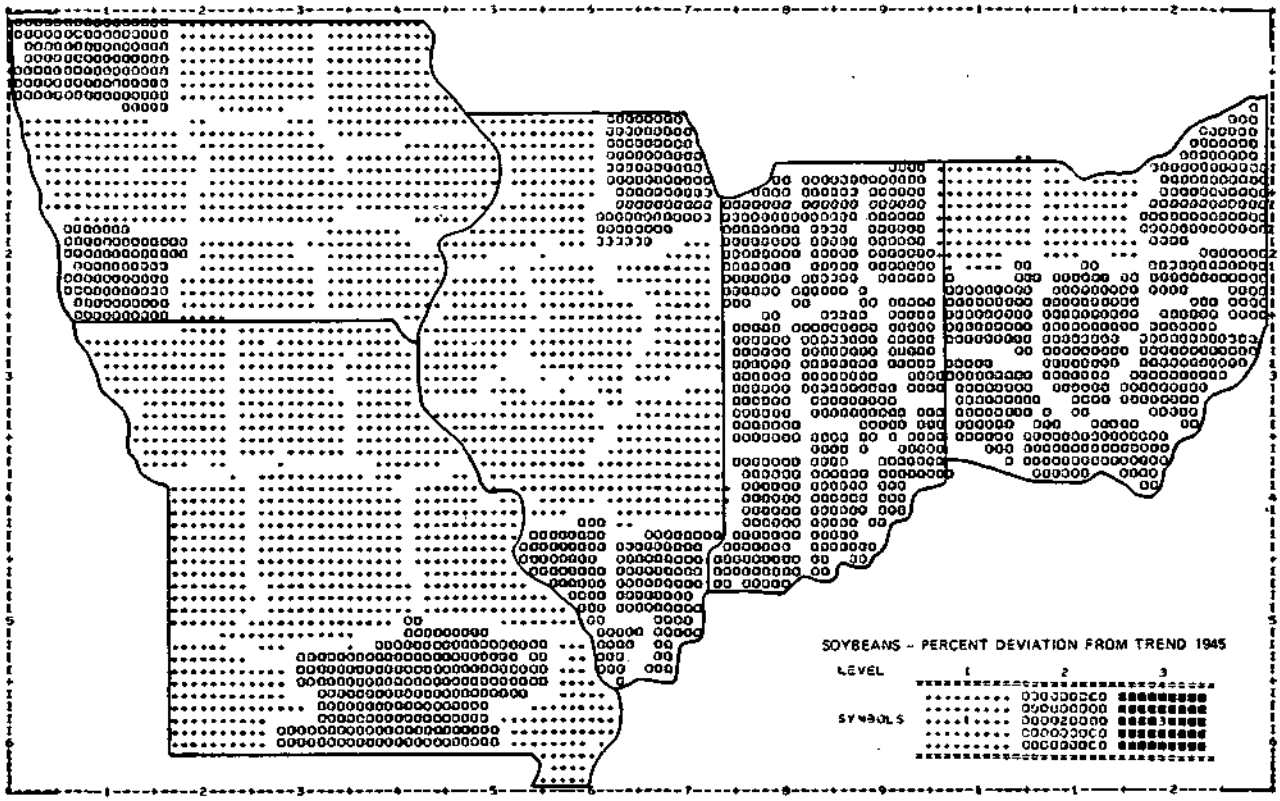
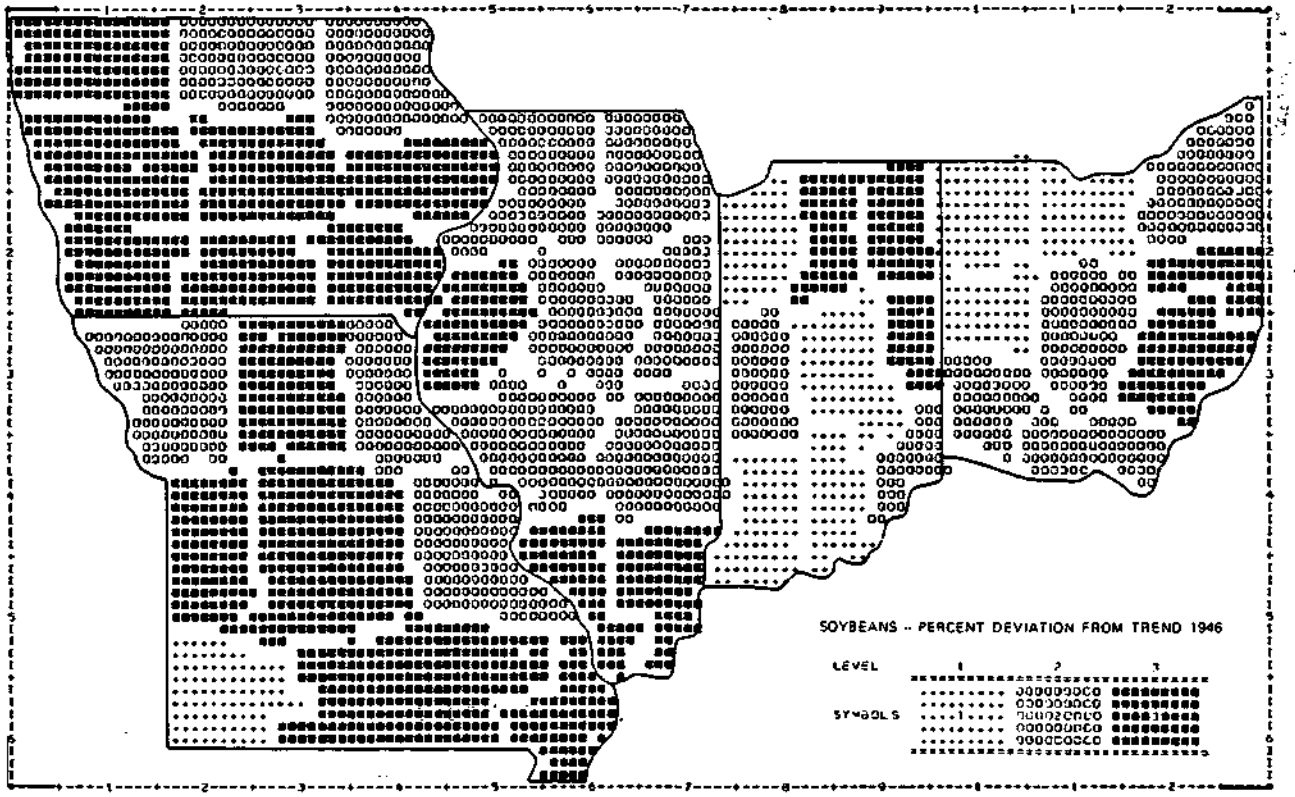
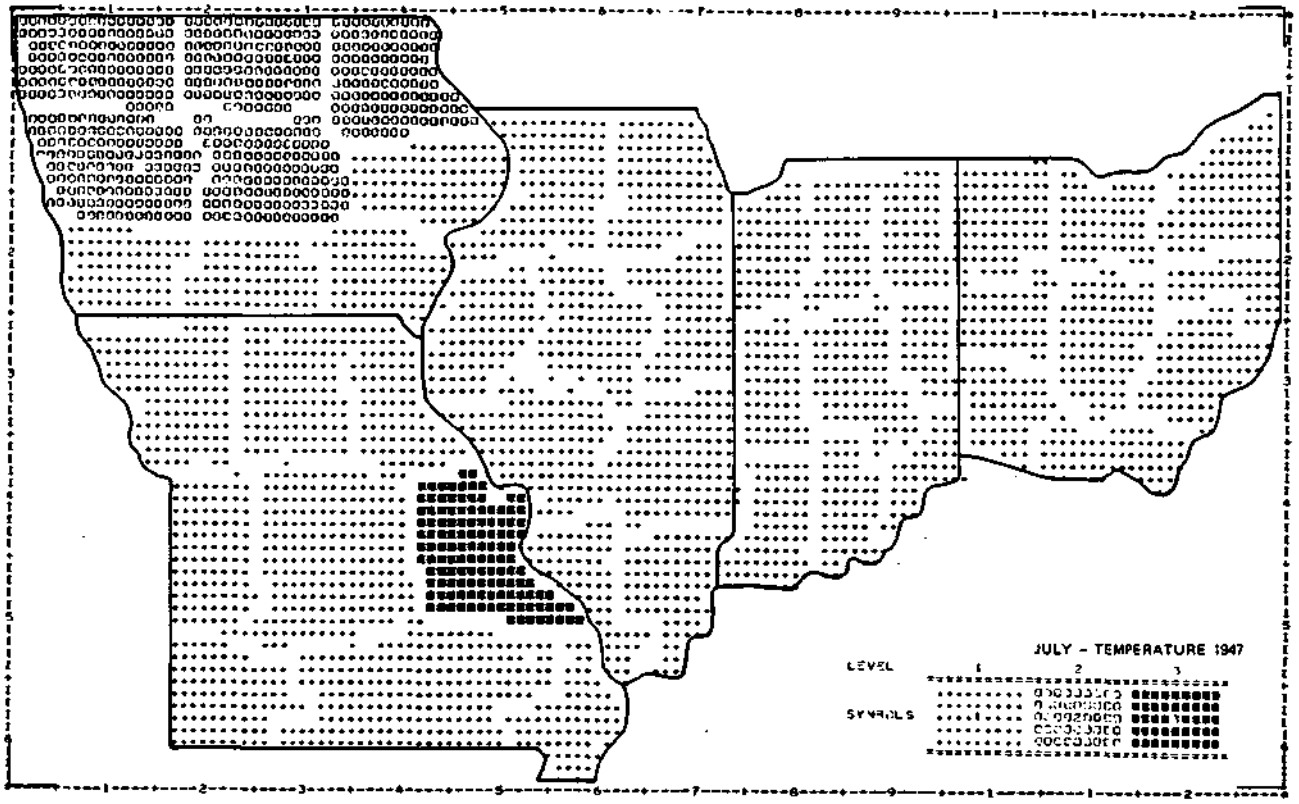
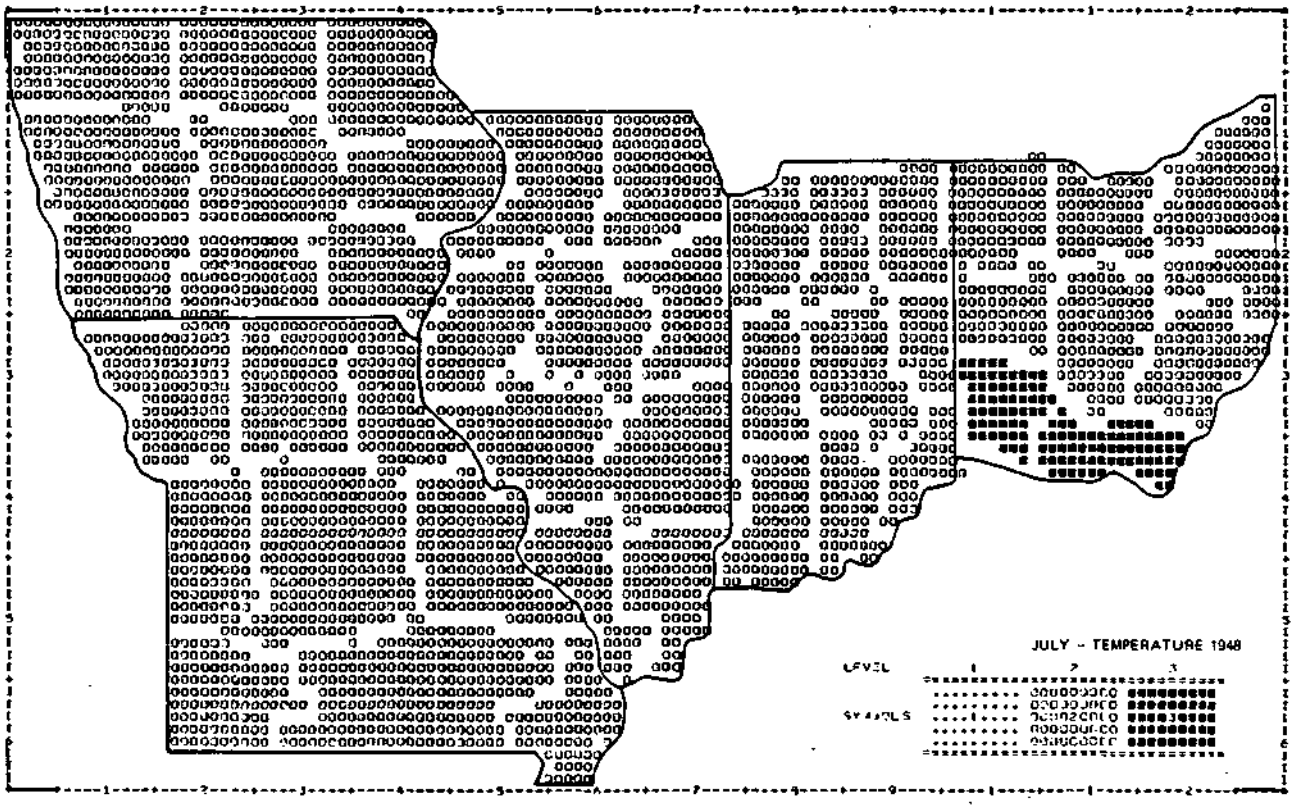
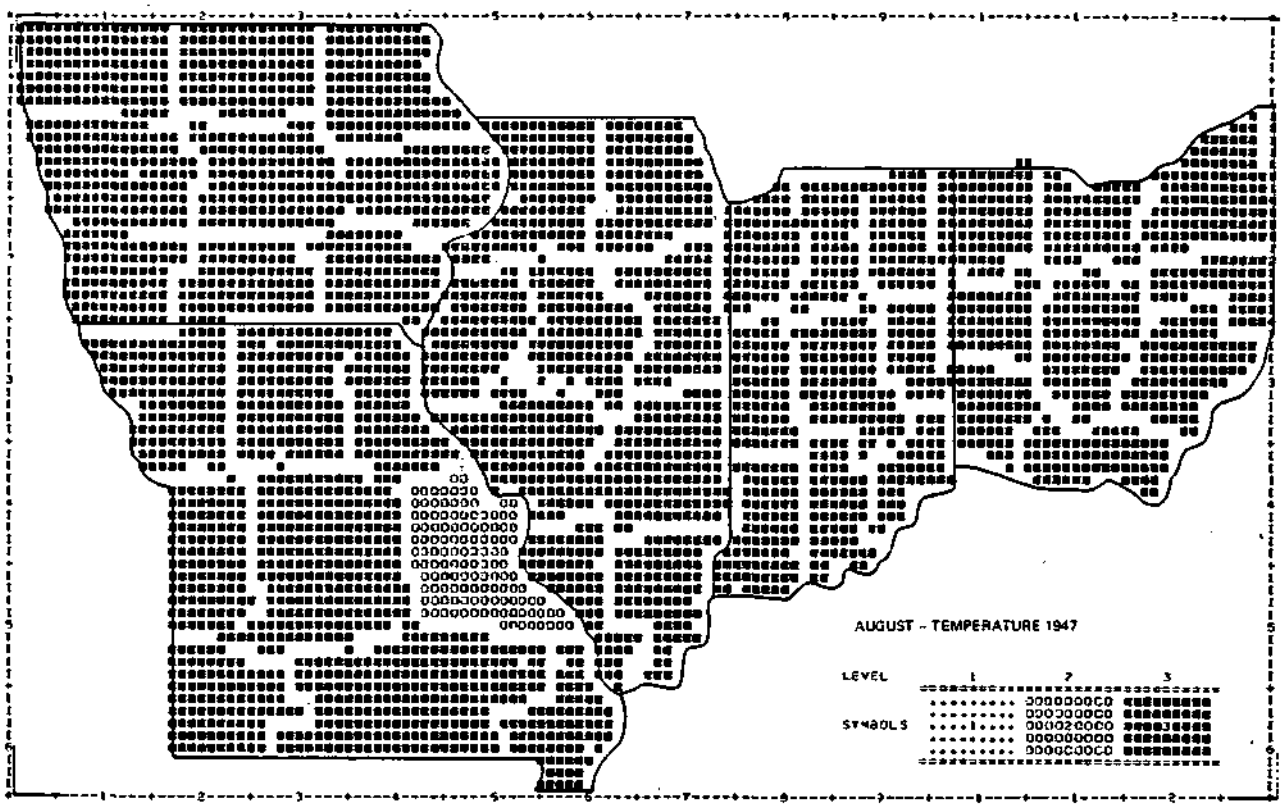
SYMBOLS

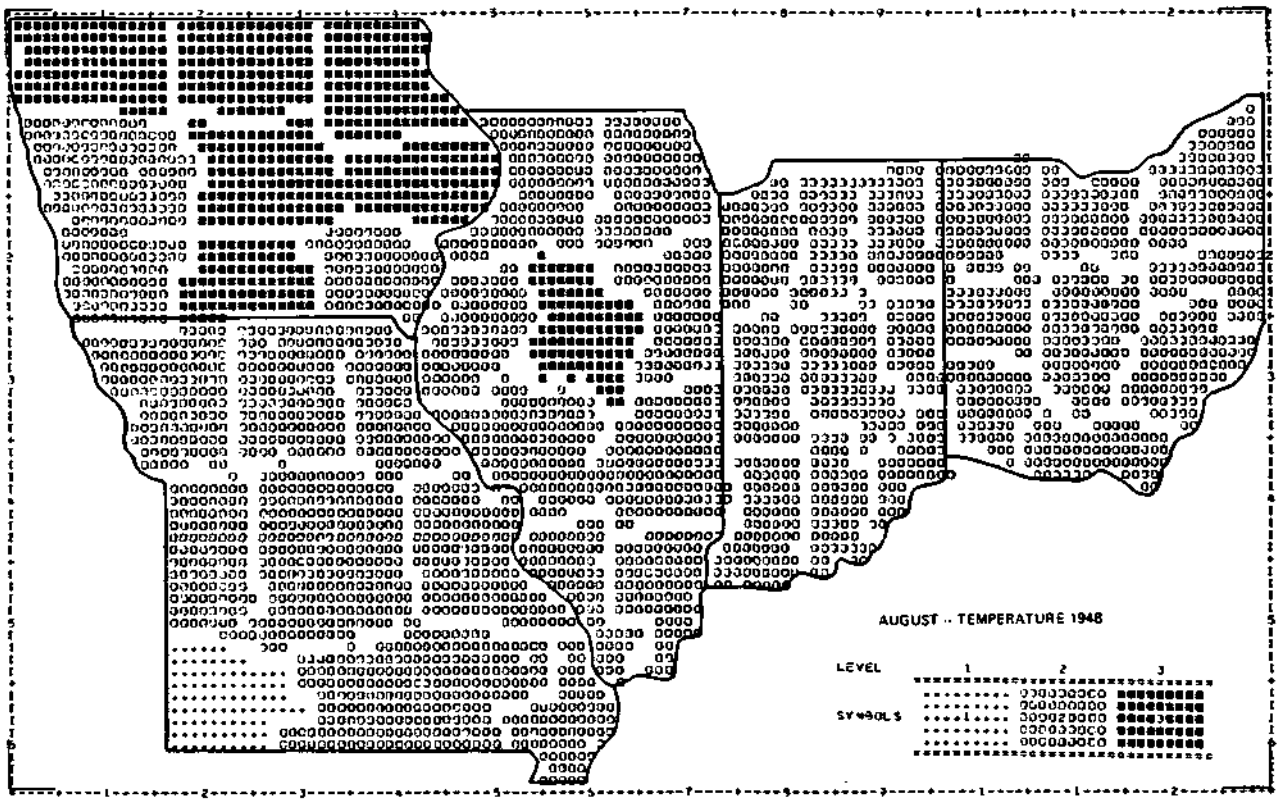

SOYBEANS - PERCENT DEVIATION FROM TREND 1945
LEVEL
1
2
3
SYMBOLS

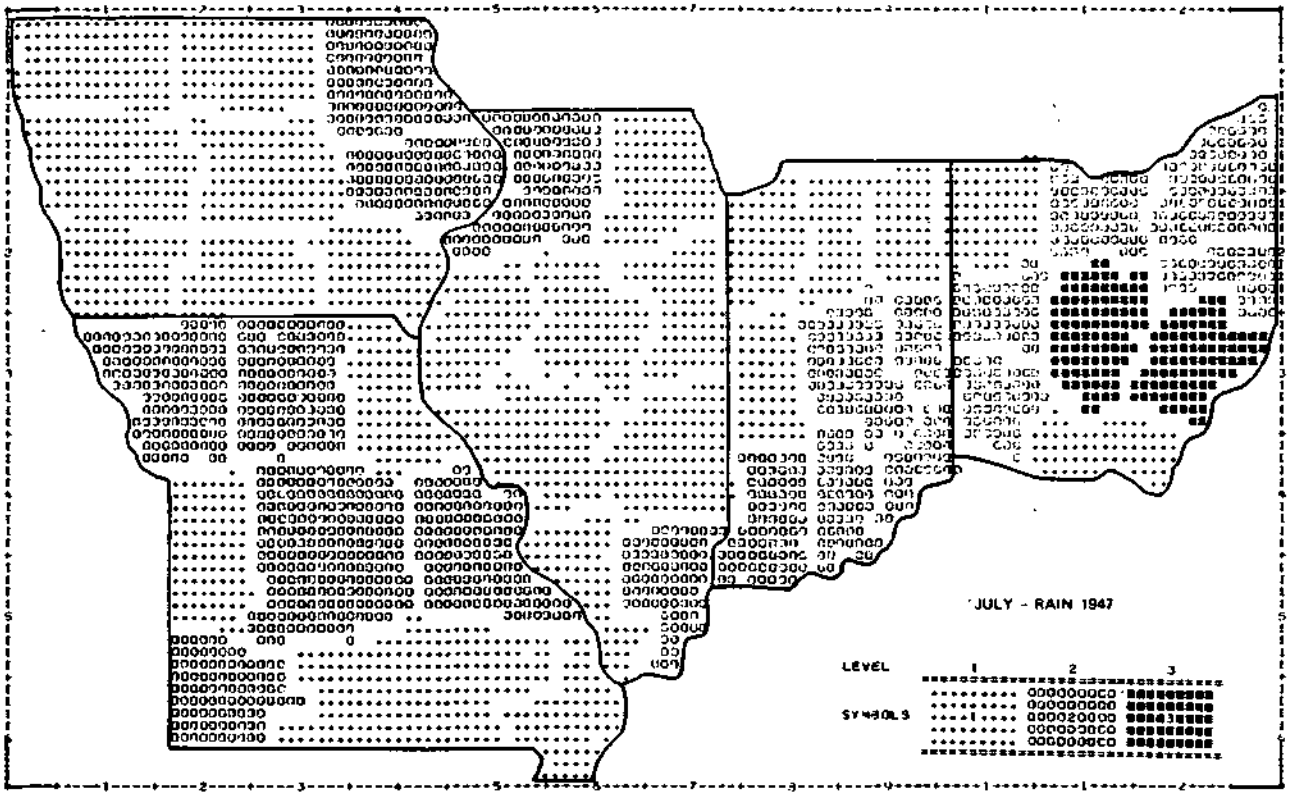

SOYBEANS - PERCENT DEVIATION FROM TREND 1946
LEVEL
1
2
3
SYMBOLS

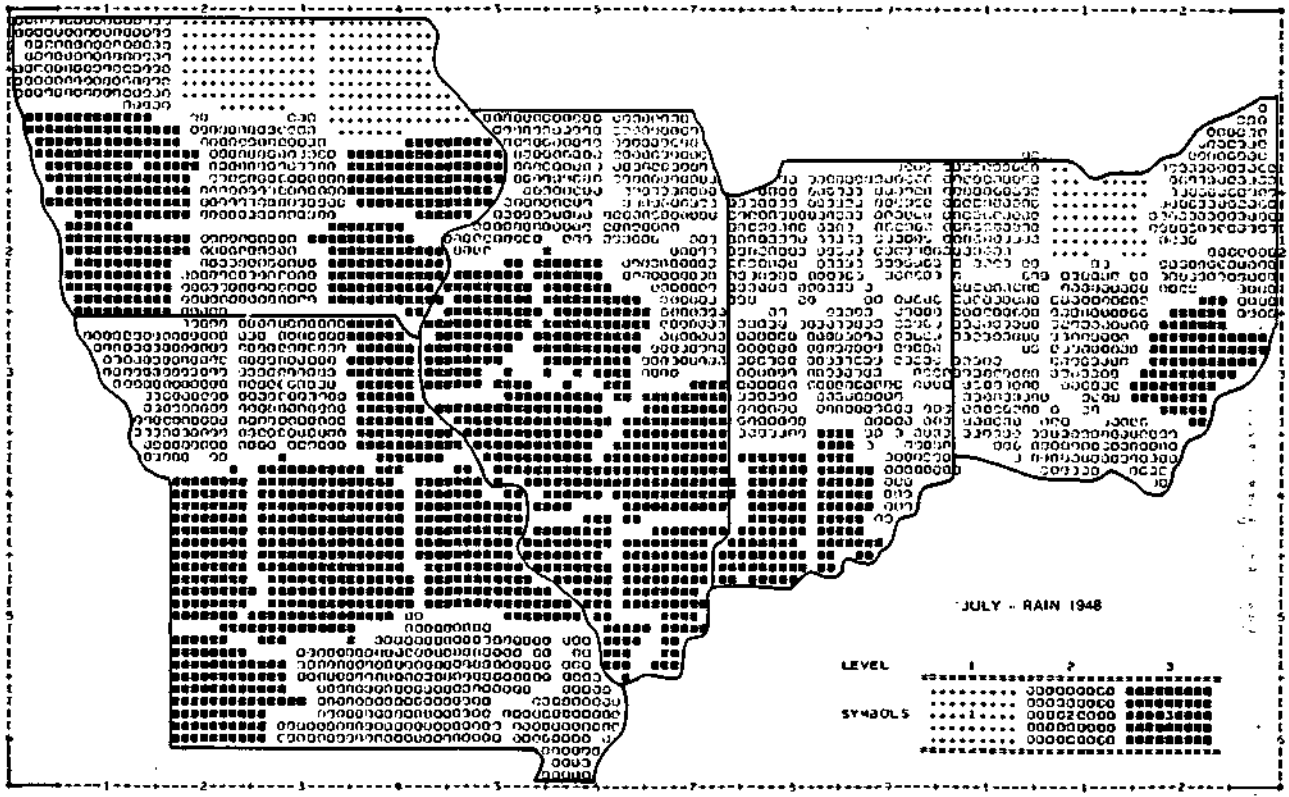

JULY - TEMPERATURE 1947
LEVEL
SYMBOLS


JULY - TEMPERATURE 1948
LEVEL
SYMBOLS


AUGUST - TEMPERATURE 1947
LEVEL
1
2
3
SYMBOLS


AUGUST - TEMPERATURE 1948
LEVEL
1
2
3
SYMBOLS


JULY - RAIN 1947
LEVEL
1
2
3
SYMBOLS


JULY - RAIN 1948
LEVEL
1
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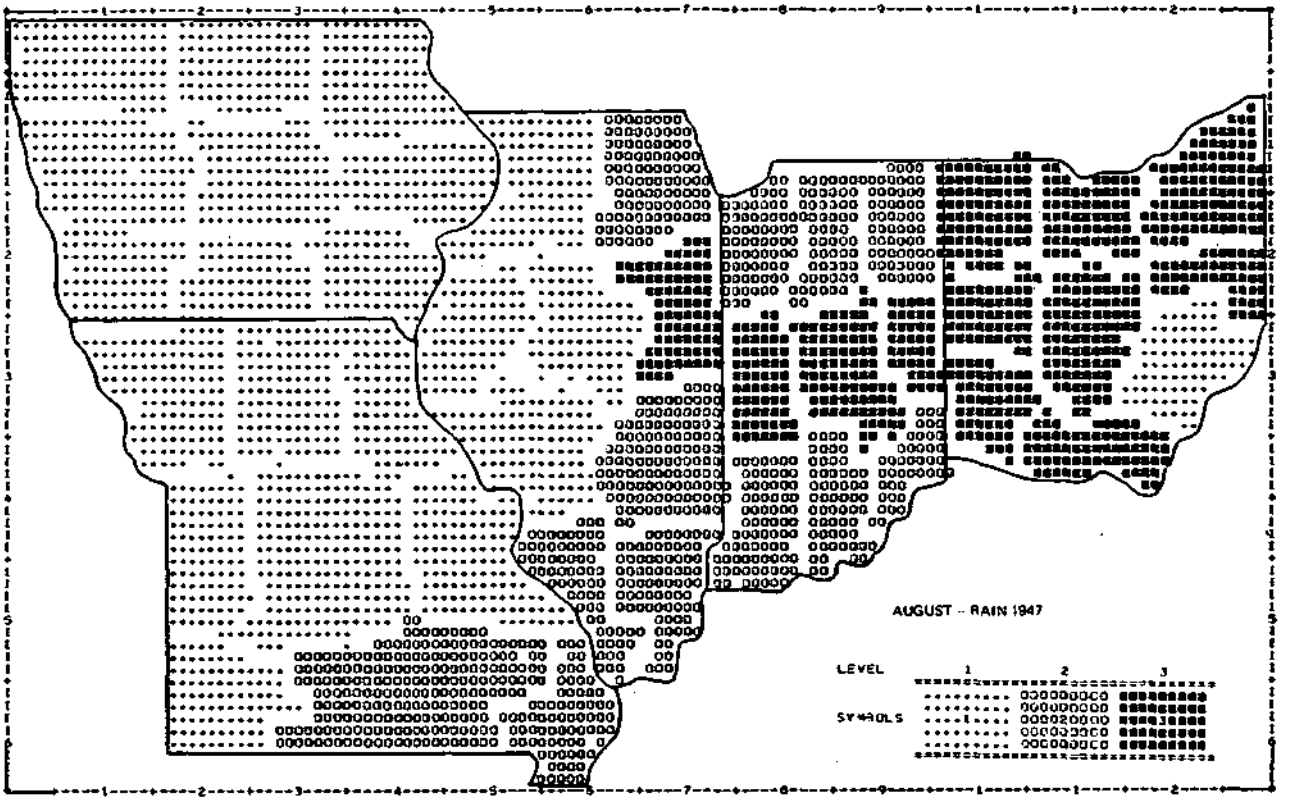
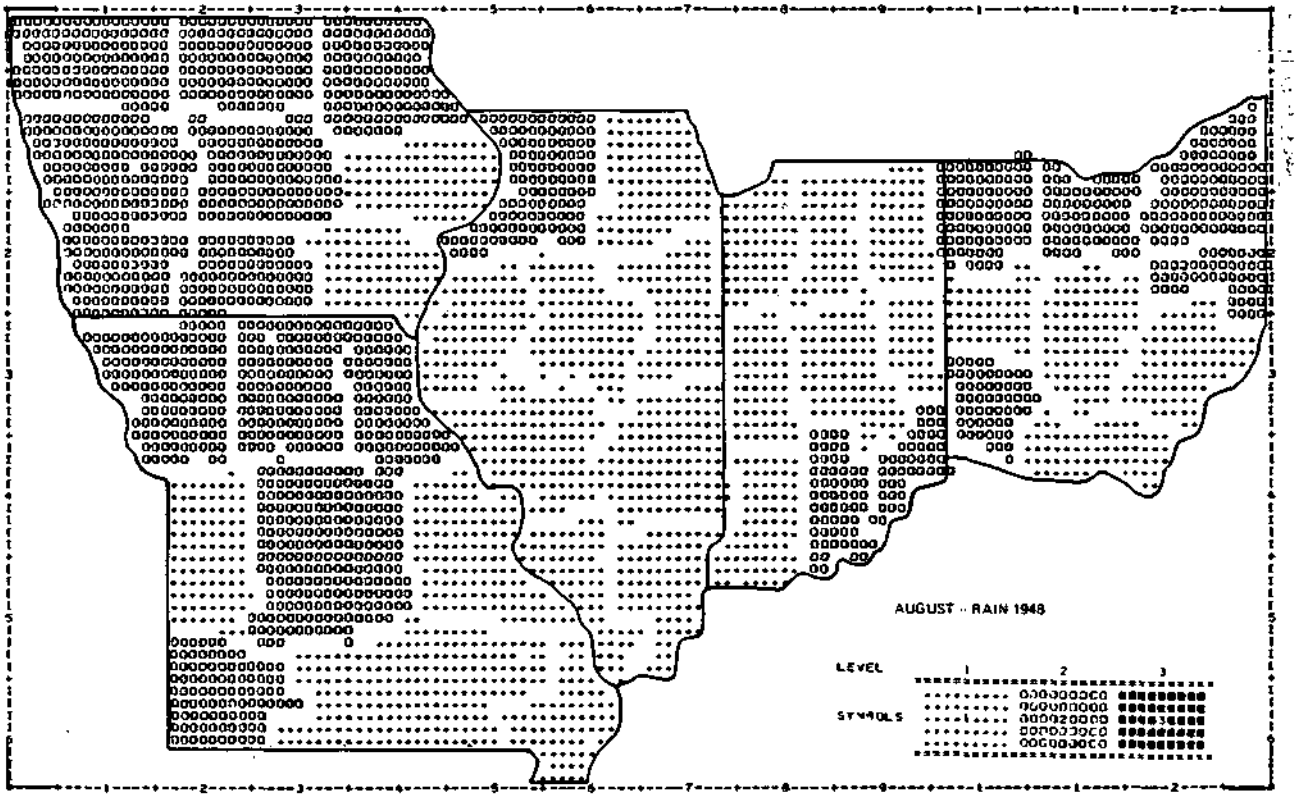
SYMBOLS


AUGUST -- RAIN 1947
LEVEL
1
2
3
SYMBOLS


AUGUST -- RAIN 1948
LEVEL
1
2
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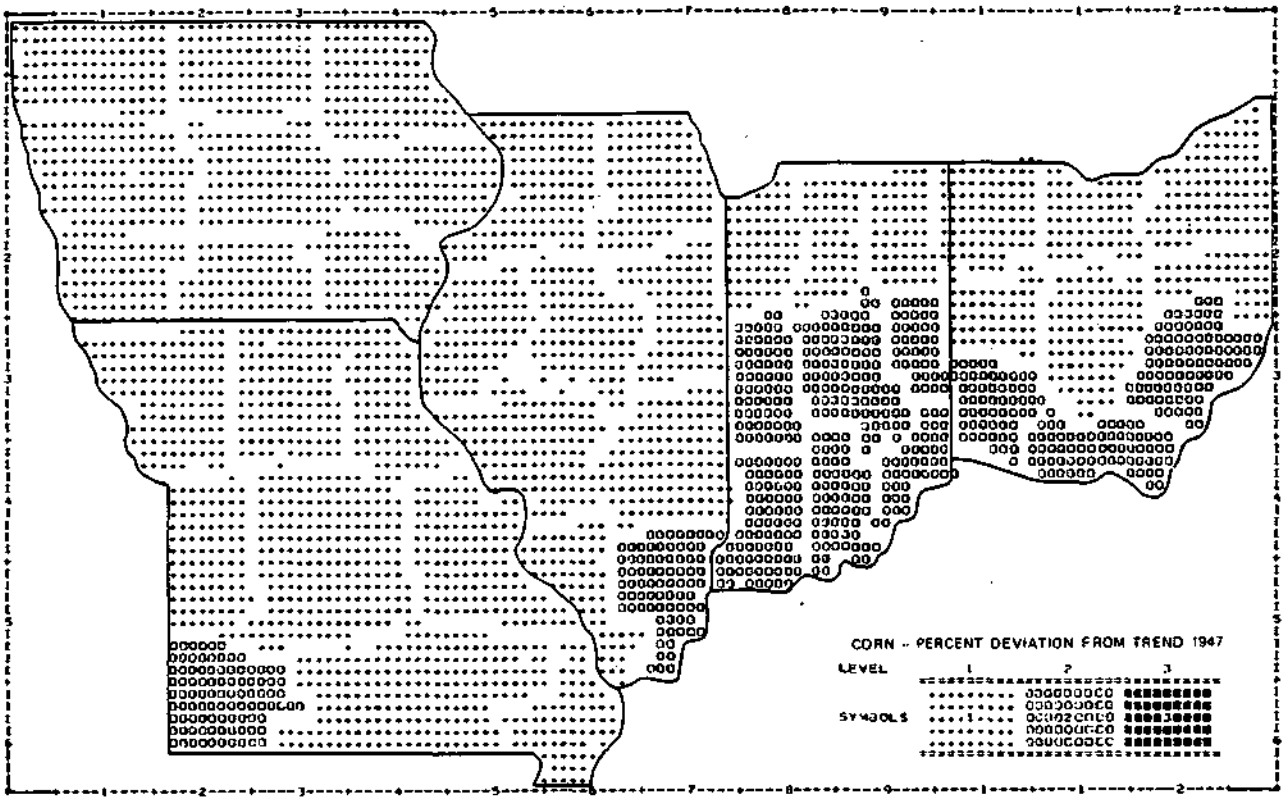
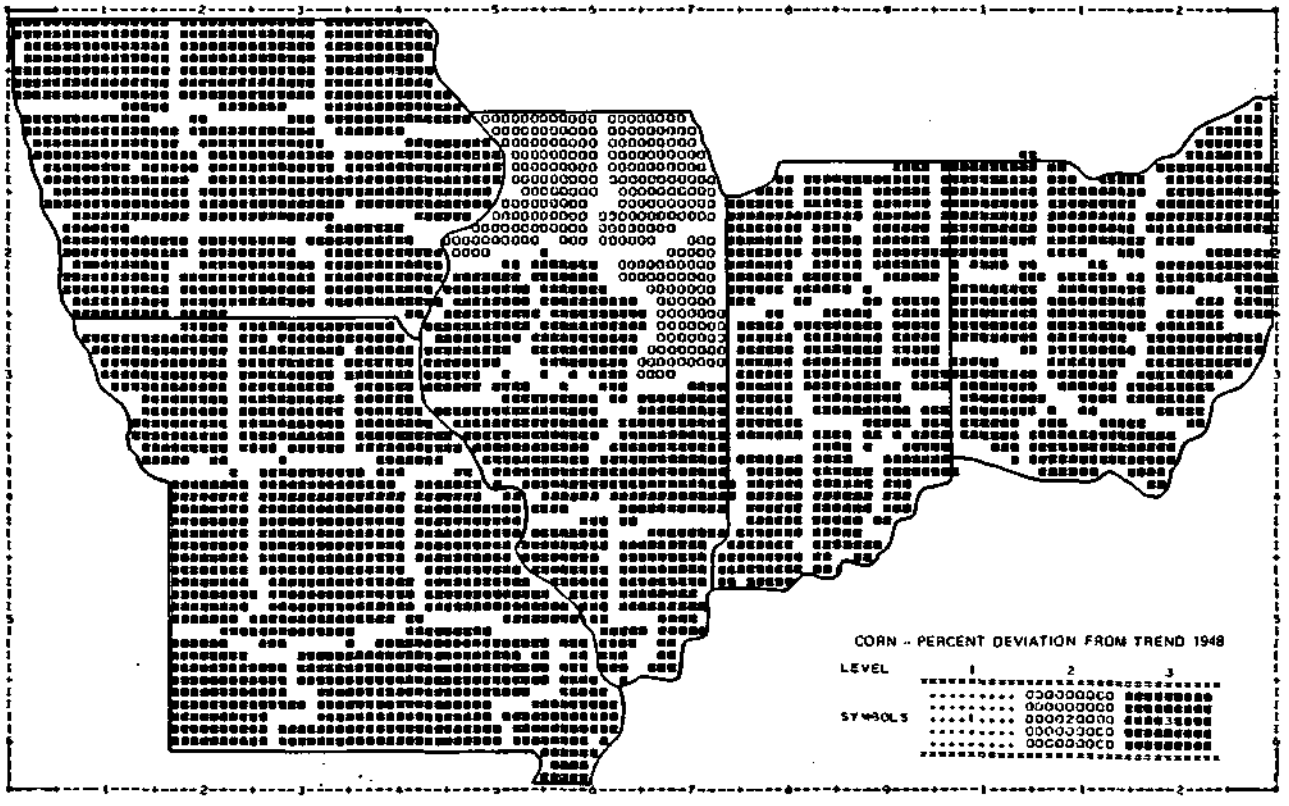
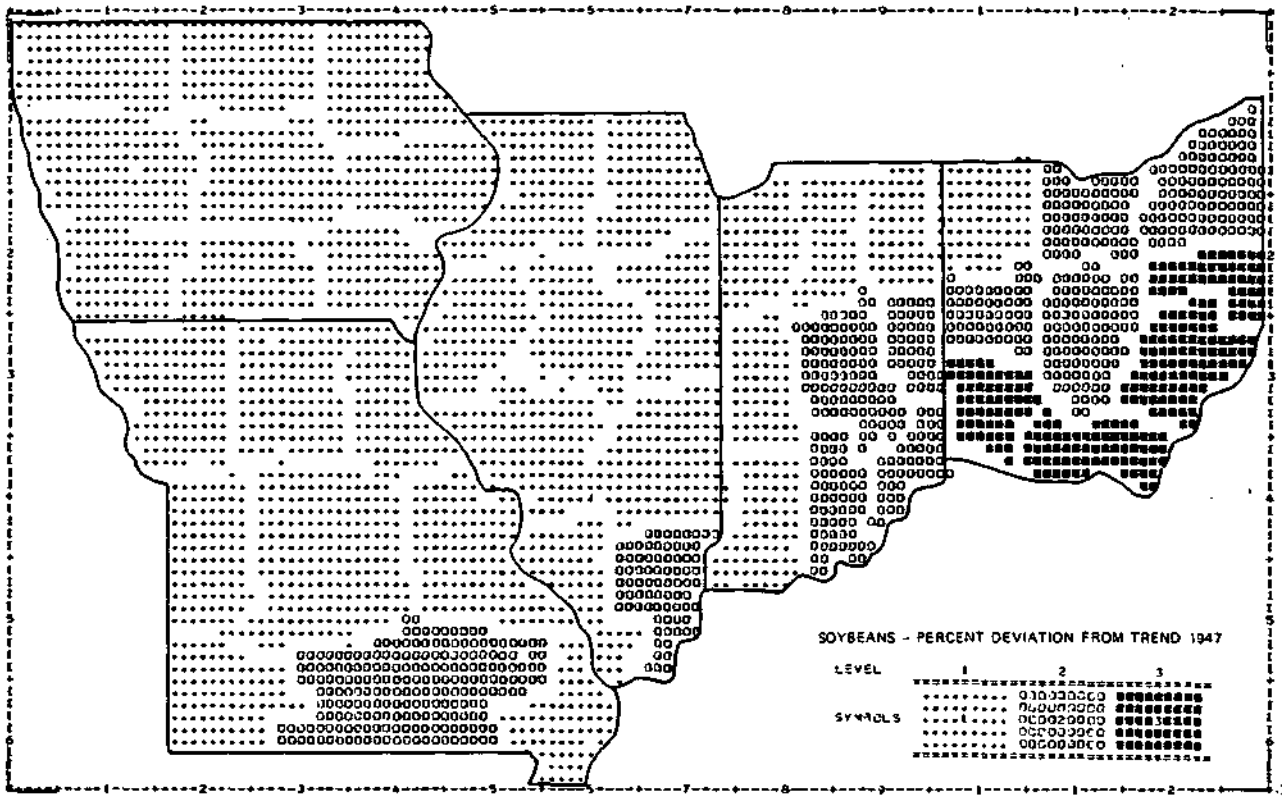
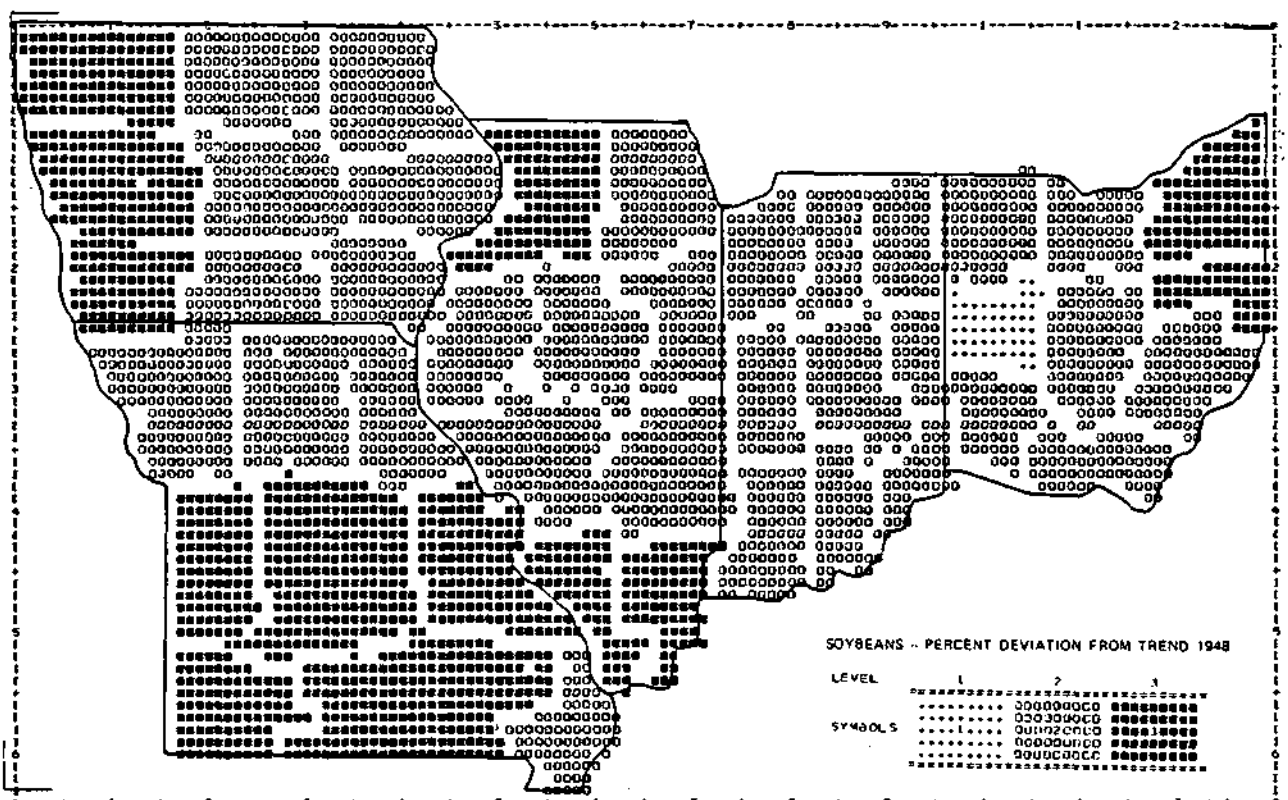
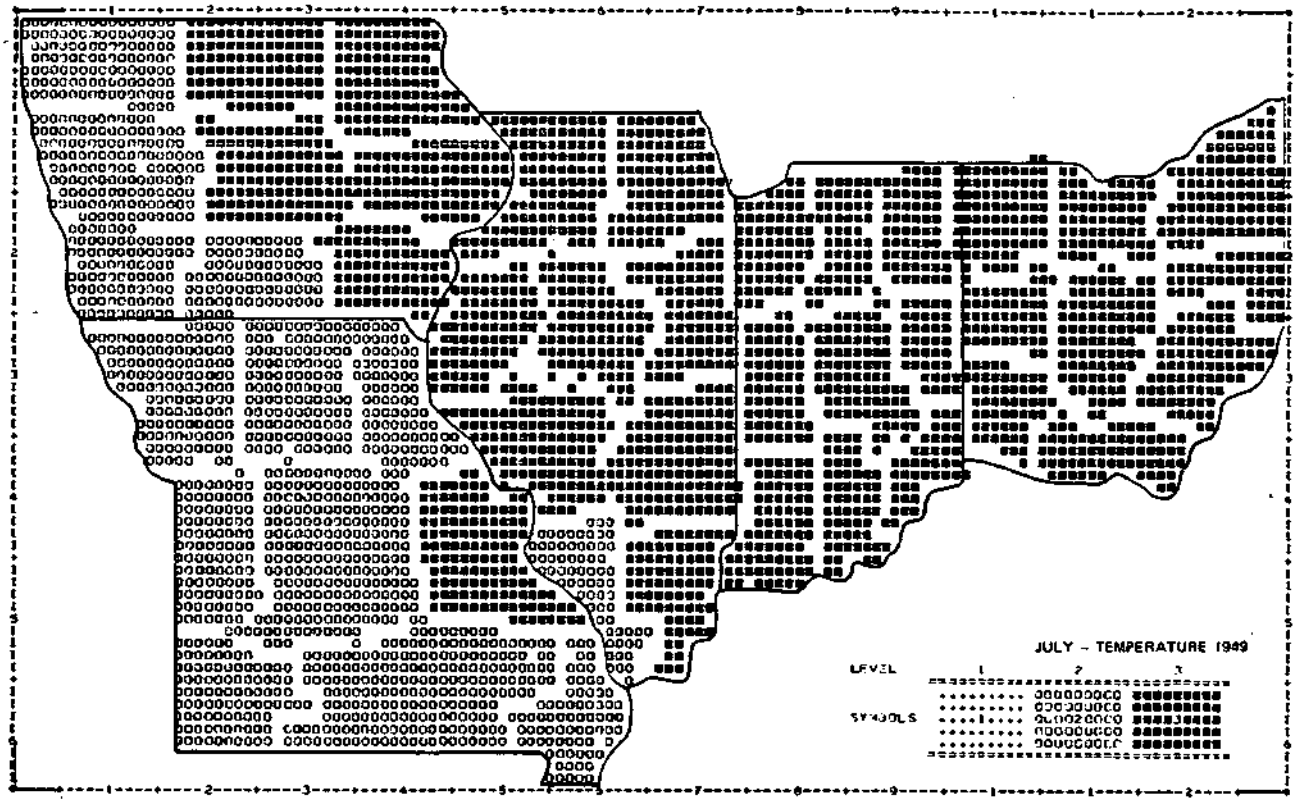
SYMBOLS

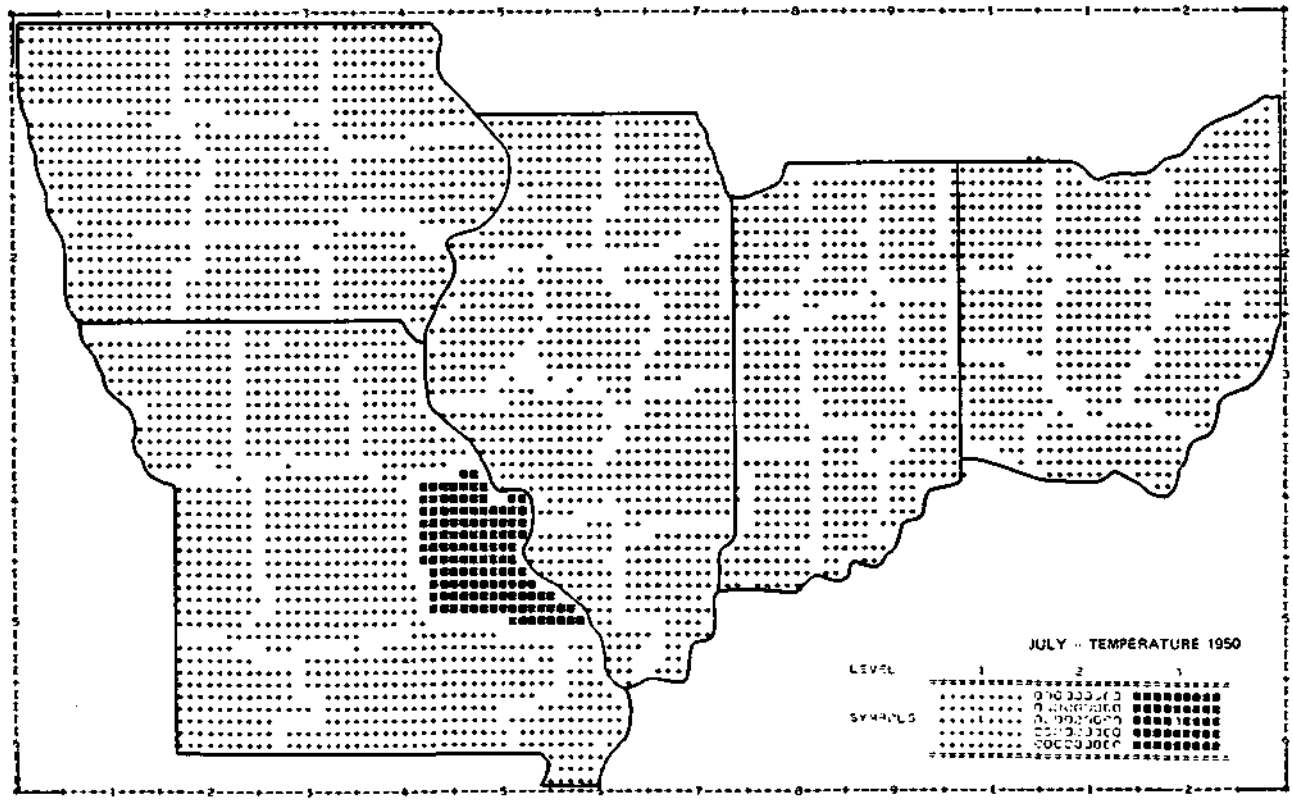

CORN - PERCENT DEVIATION FROM TREND 1947
LEVEL
1
2
3
SYMBOLS

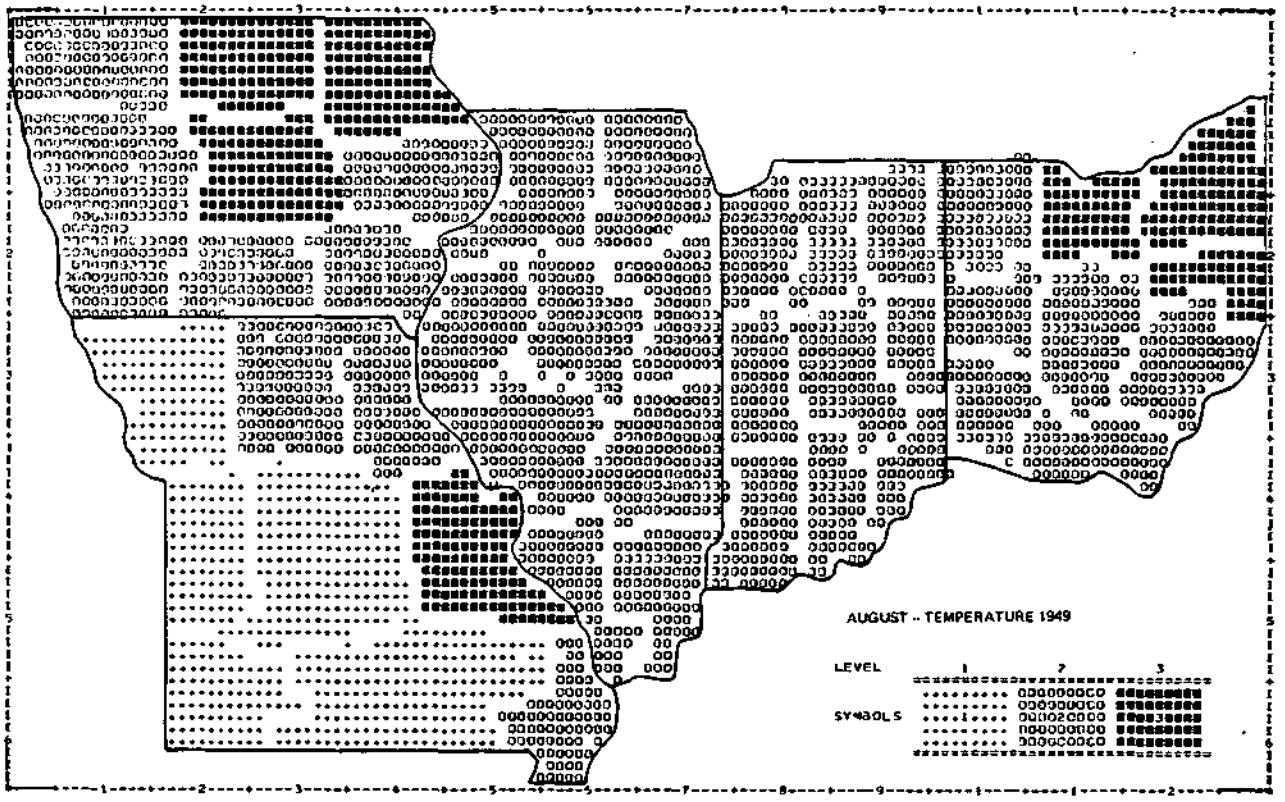

CORN - PERCENT DEVIATION FROM TREND 1948
LEVEL
1
2
3
SYMBOLS

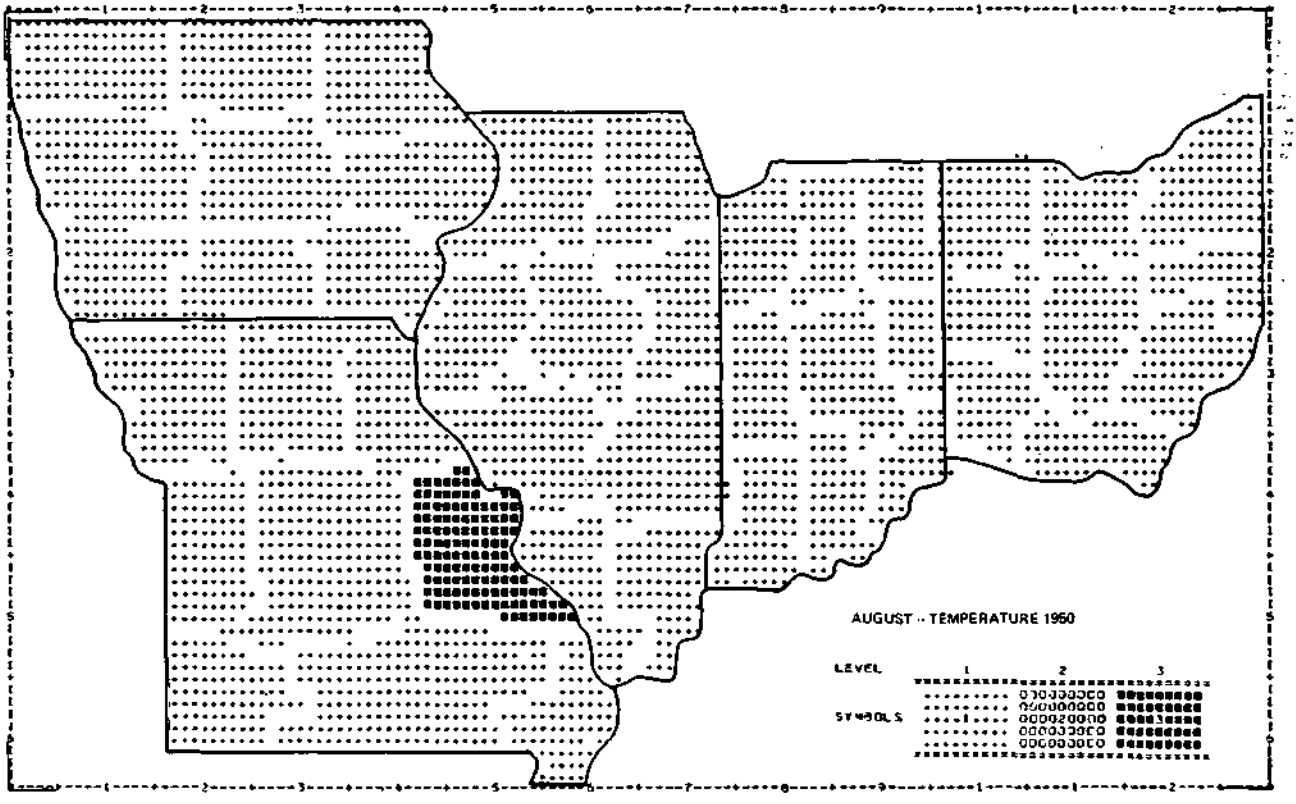

SOYBEANS - PERCENT DEVIATION FROM TREND 1947
LEVEL
1
2
3
SYMBOLS


SOYBEANS - PERCENT DEVIATION FROM TREND 1948
LEVEL
1
2
3
SYMBOLS


JULY – TEMPERATURE 1949
LEVEL
SYMBOLS


JULY – TEMPERATURE 1950
LEVEL
SYMBOLS


AUGUST -- TEMPERATURE 1949
LEVEL
1
2
3
SYMBOLS


AUGUST -- TEMPERATURE 1960
LEVEL
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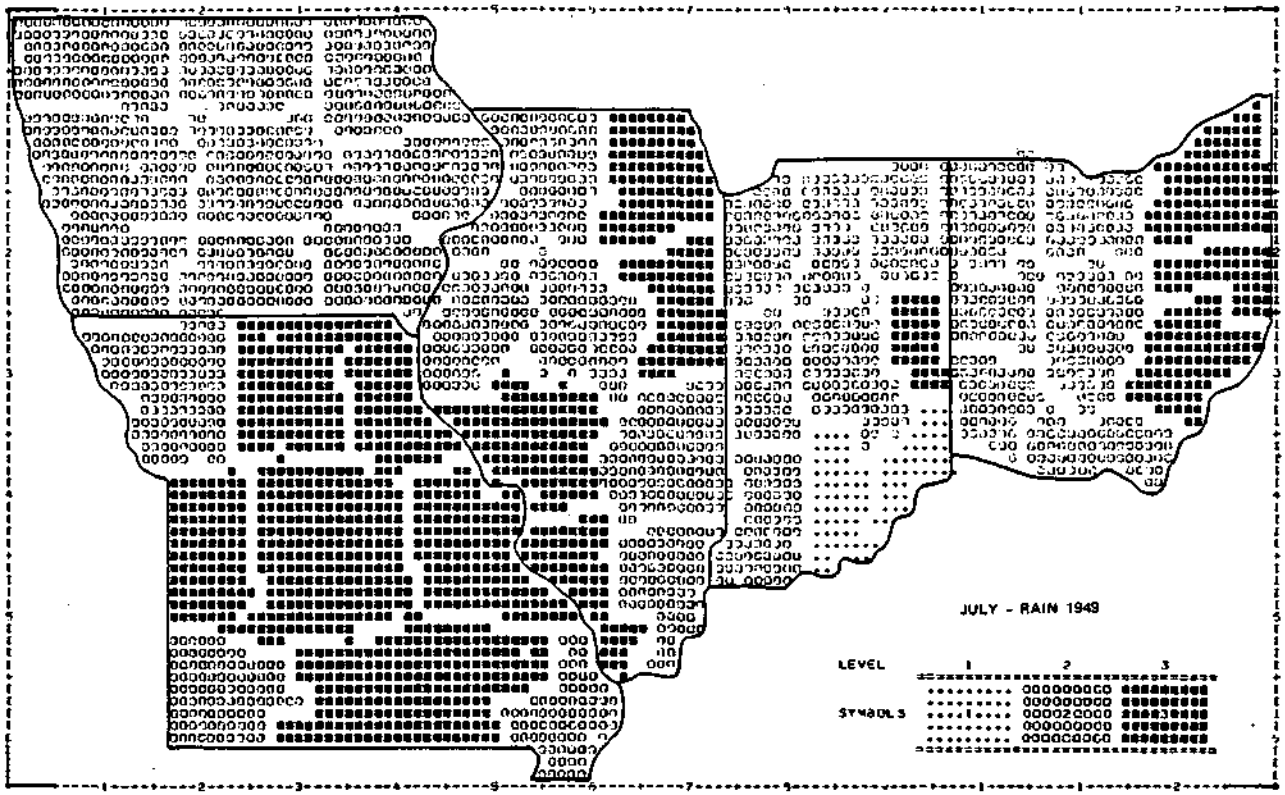
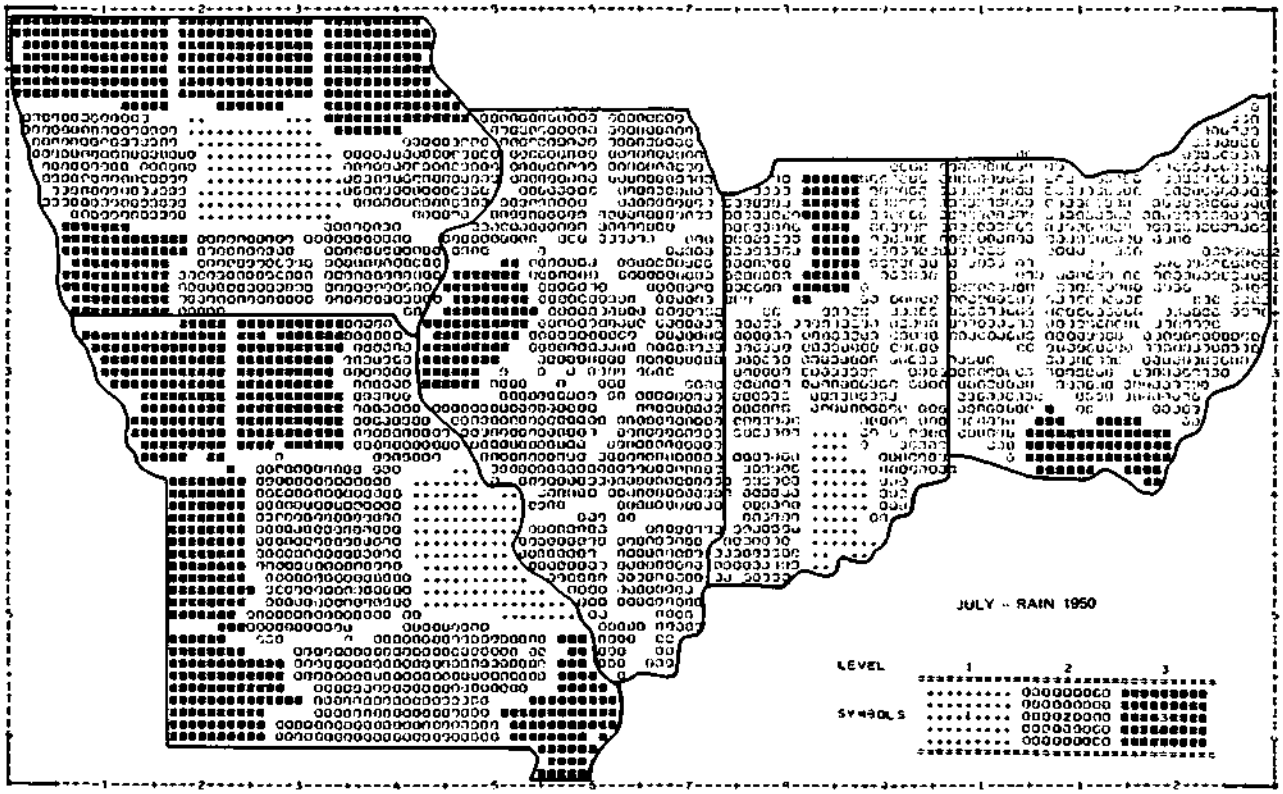
SYMBOLS


JULY - RAIN 1949
LEVEL
1
2
3
SYMBOLS


JULY - RAIN 1950
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1
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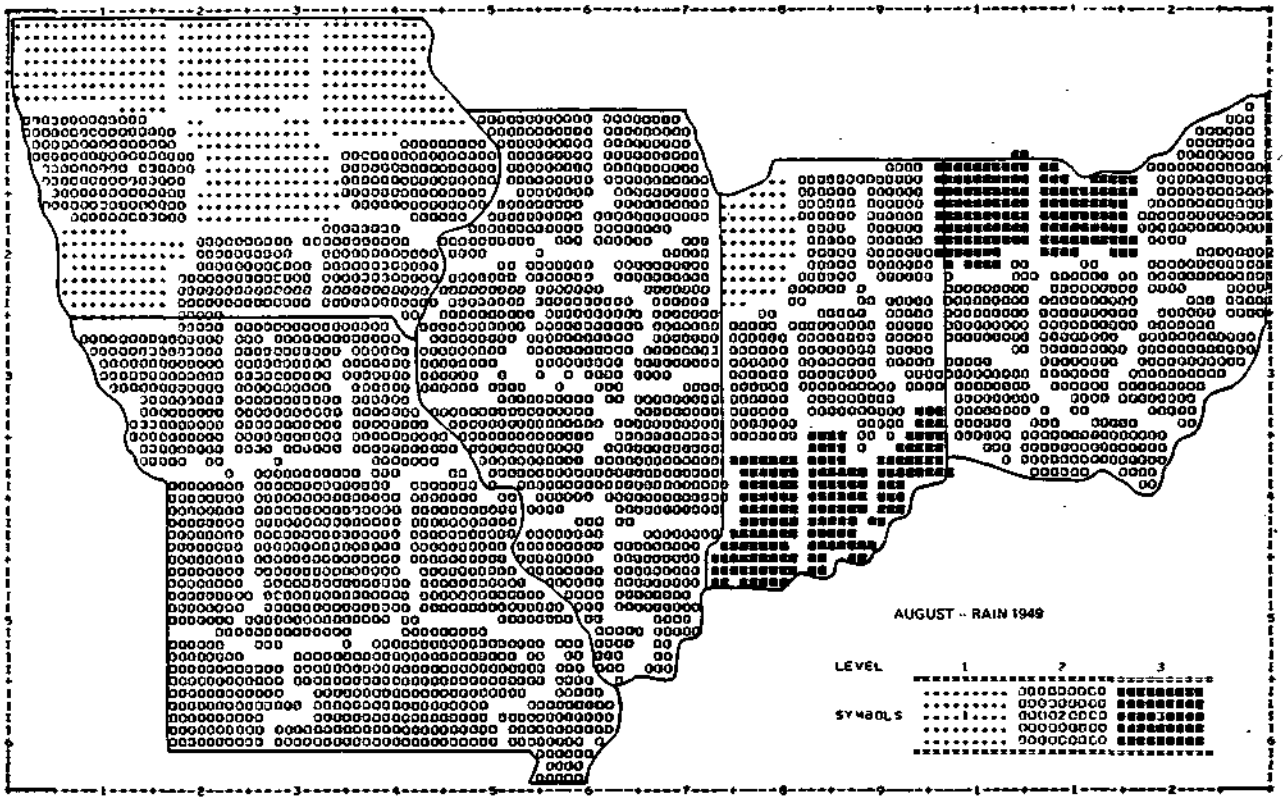
SYMBOLS


AUGUST -- RAIN 1949
LEVEL
1
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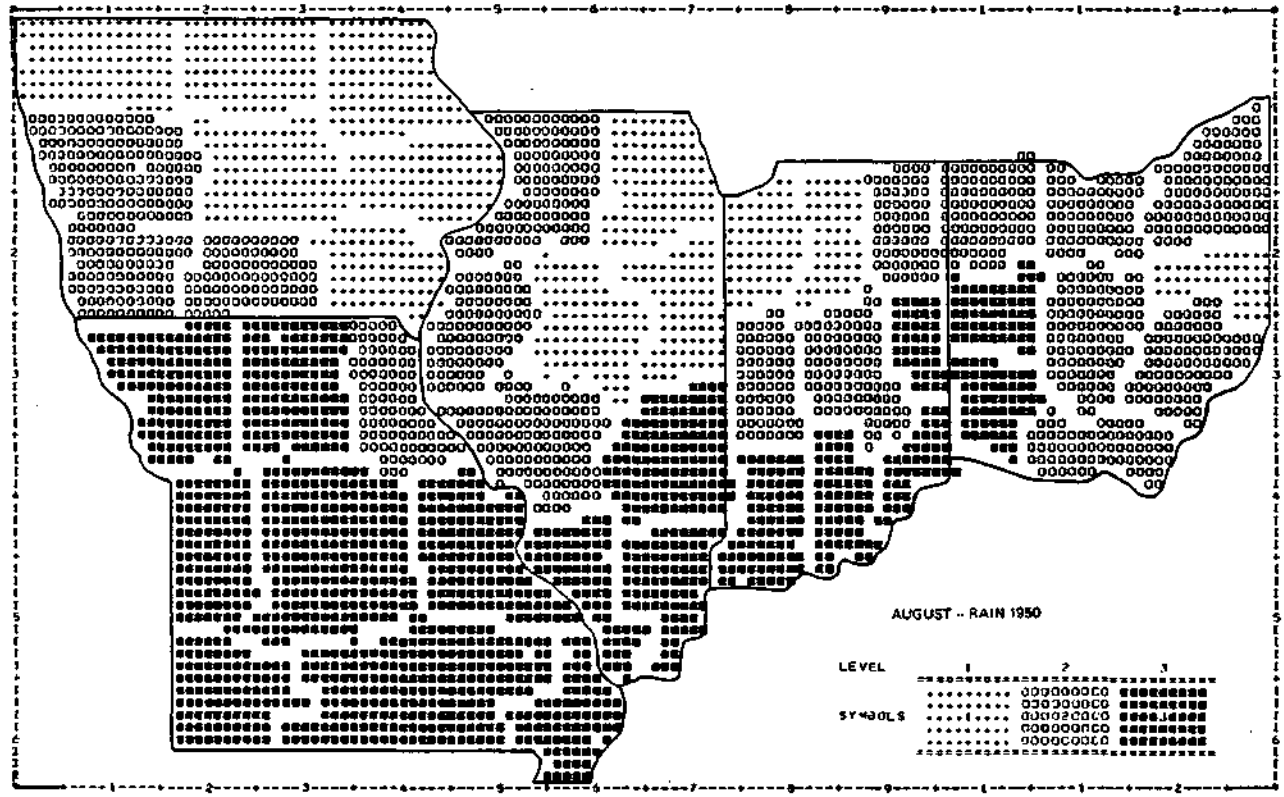
SYMBOLS


AUGUST -- RAIN 1950
LEVEL
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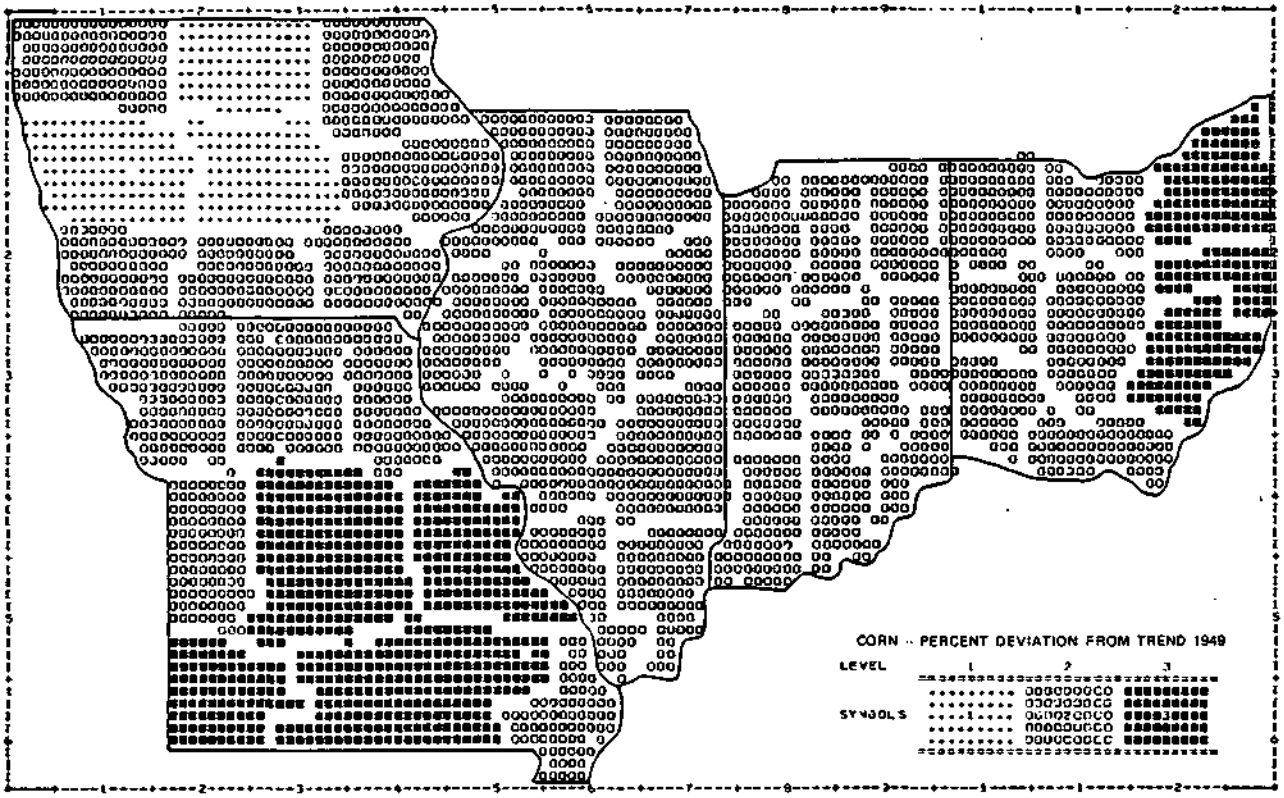
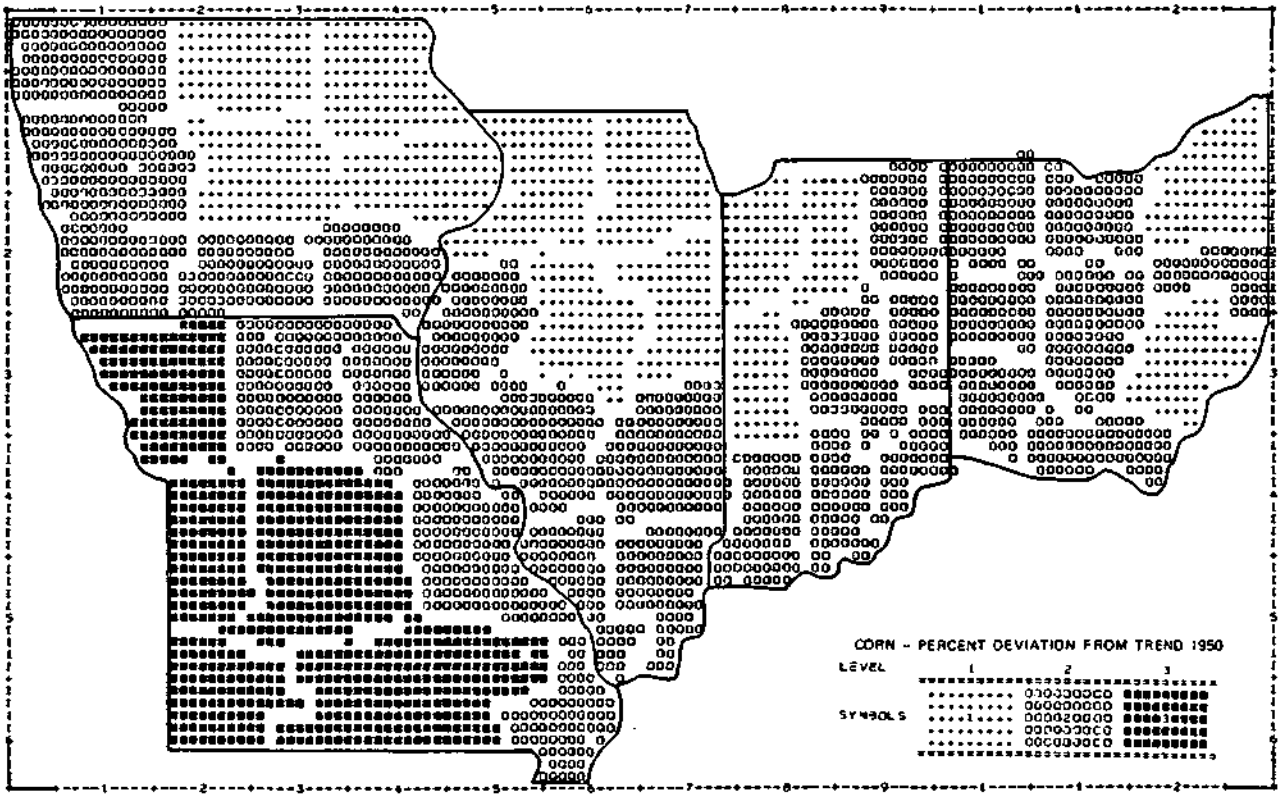
SYMBOLS


CORN - PERCENT DEVIATION FROM TREND 1949
LEVEL
1
2
3
SYMBOLS


CORN - PERCENT DEVIATION FROM TREND 1950
LEVEL
1
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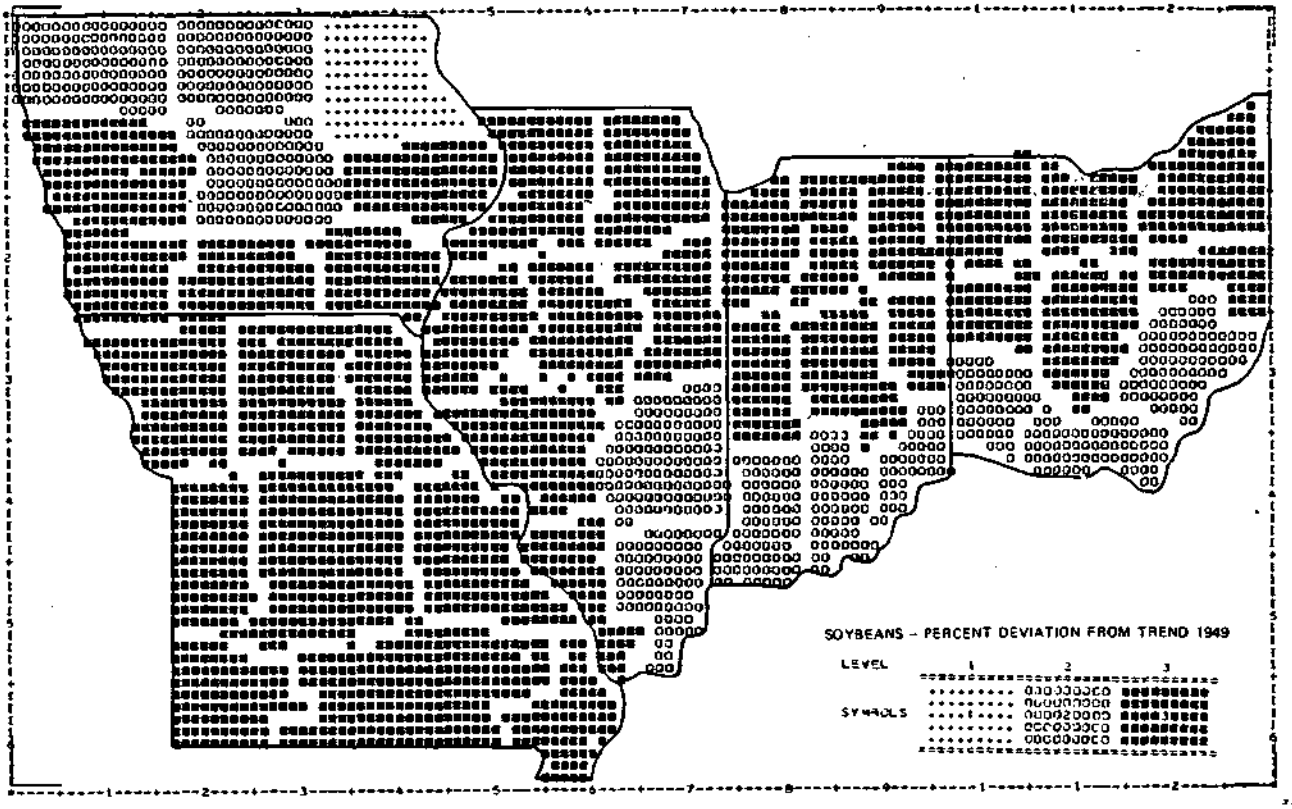
3
SYMBOLS


SOYBEANS - PERCENT DEVIATION FROM TREND 1949
LEVEL
1
2
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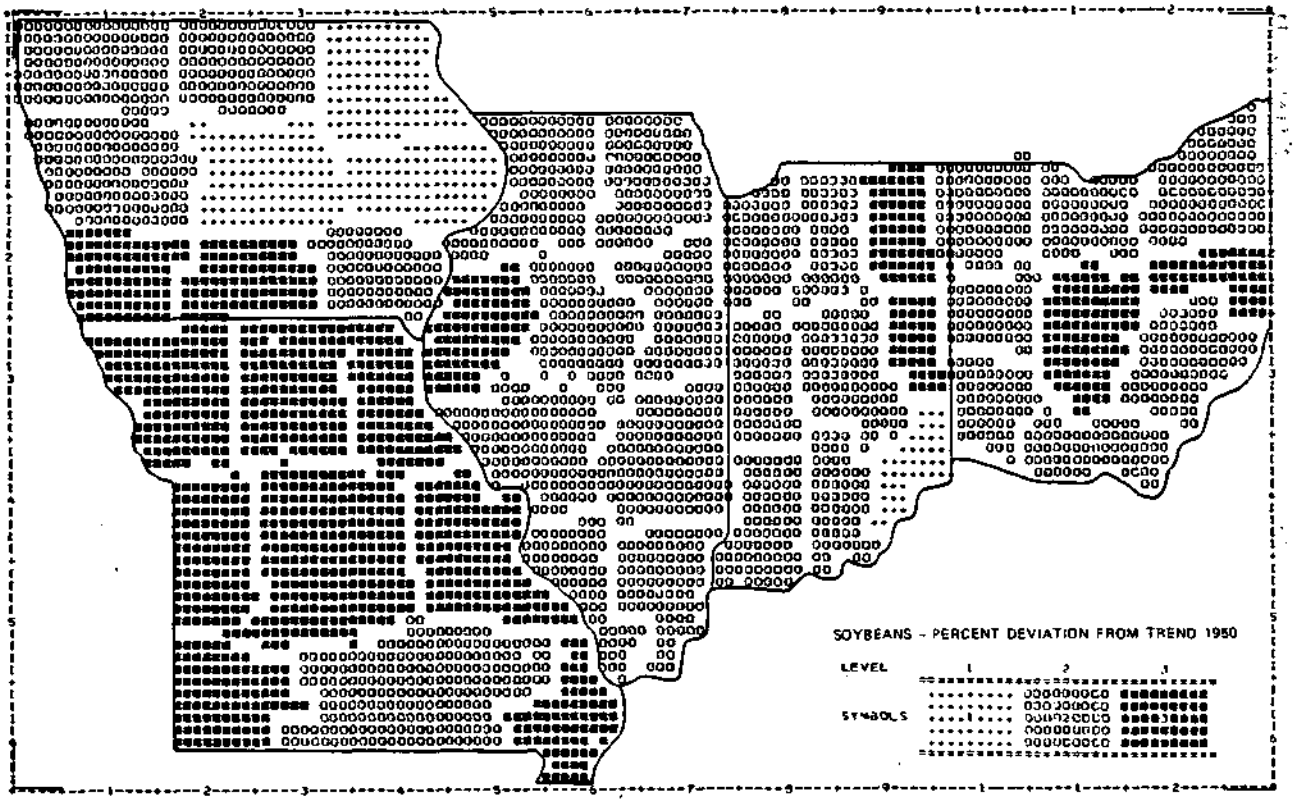
SYMBOLS


SOYBEANS - PERCENT DEVIATION FROM TREND 1950
LEVEL
1
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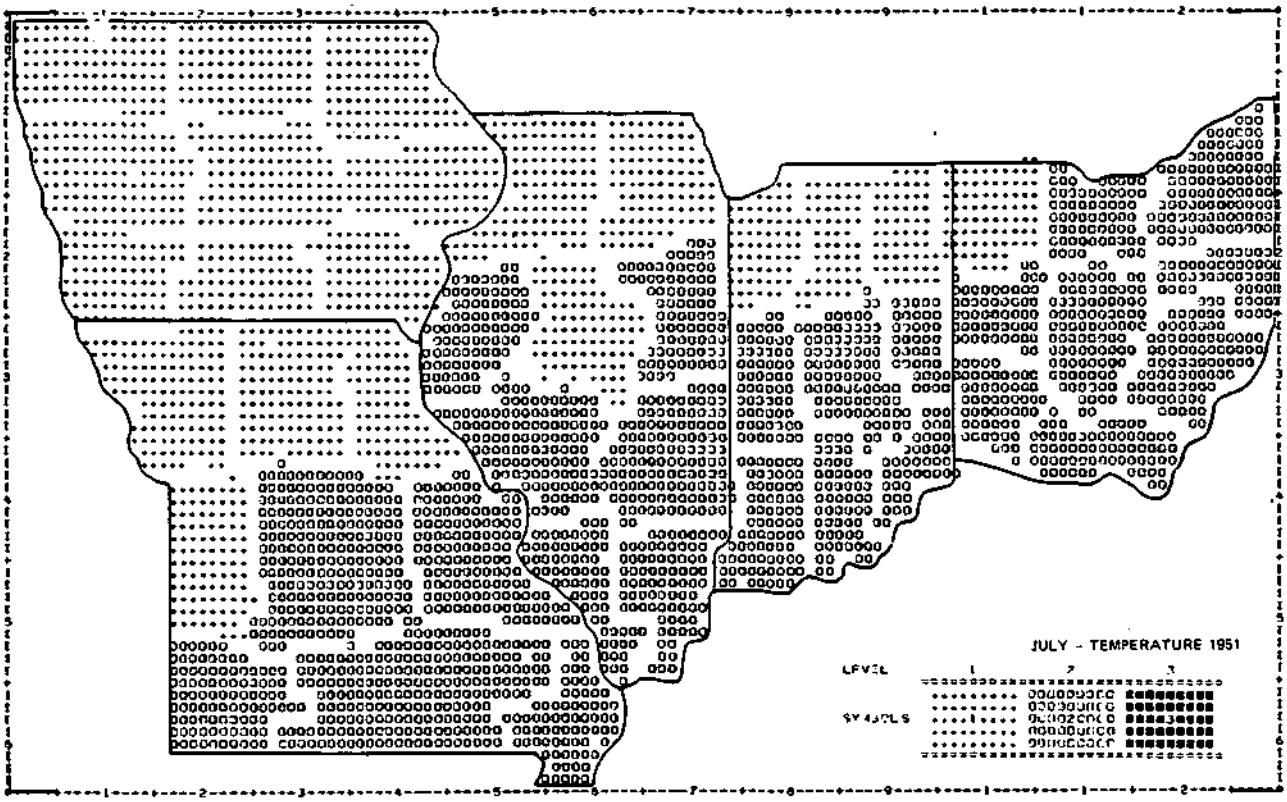
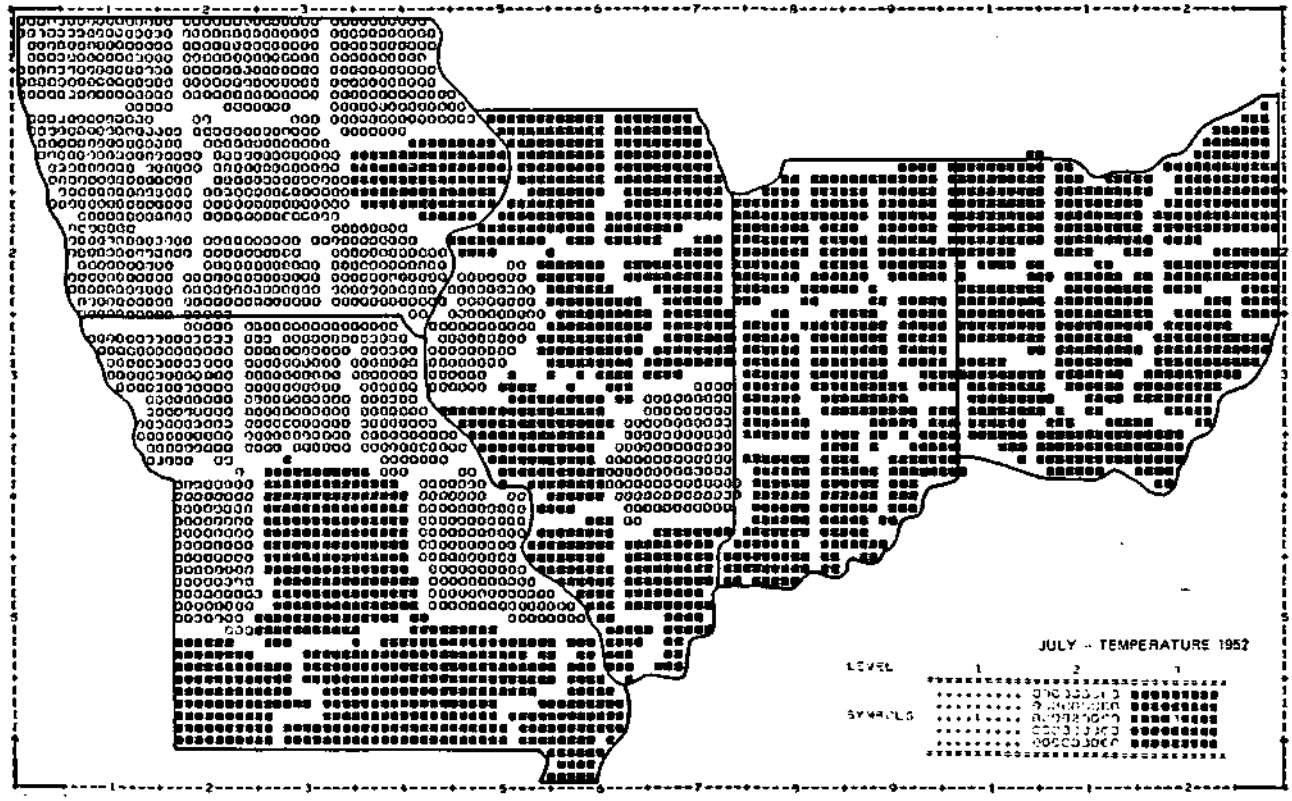
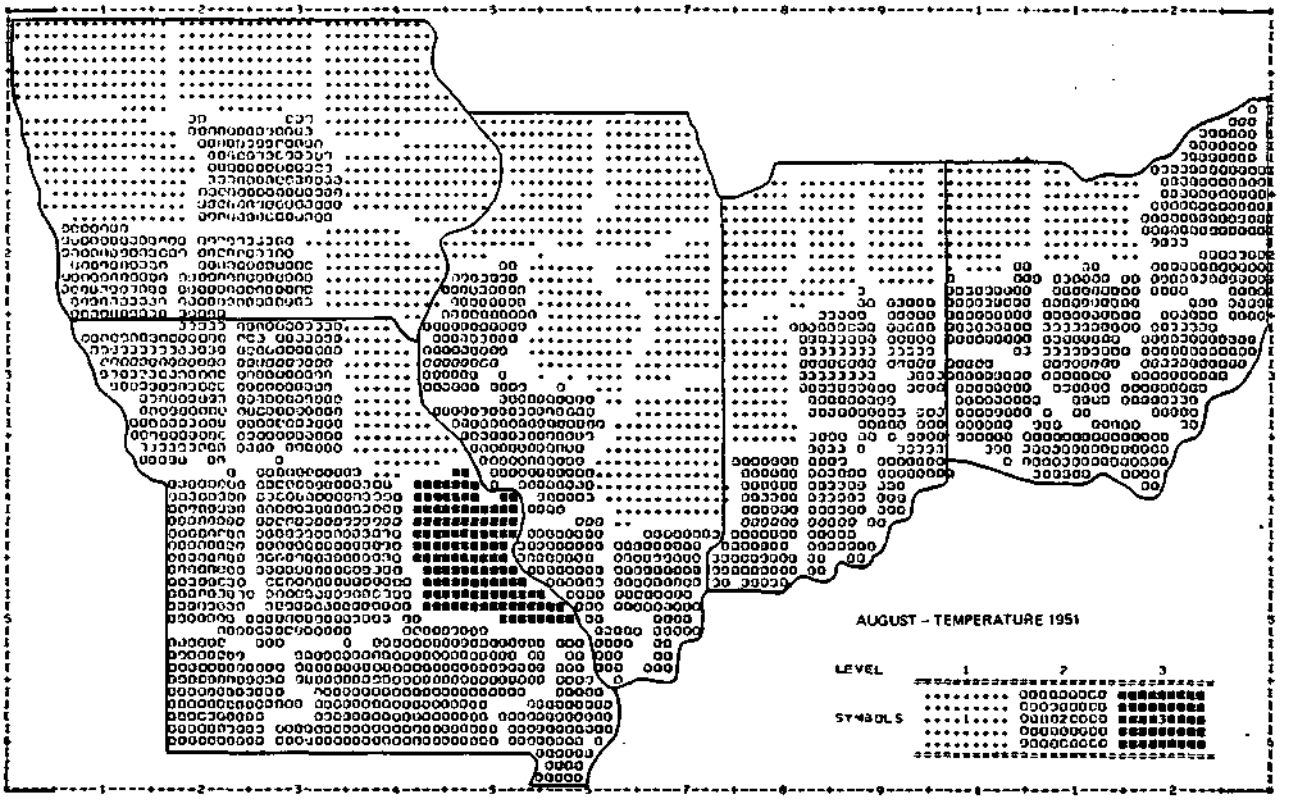
SYMBOLS


JULY - TEMPERATURE 1951
LEVEL
SYMBOLS


JULY - TEMPERATURE 1952
LEVEL
SYMBOLS


AUGUST – TEMPERATURE 1951
LEVEL
1
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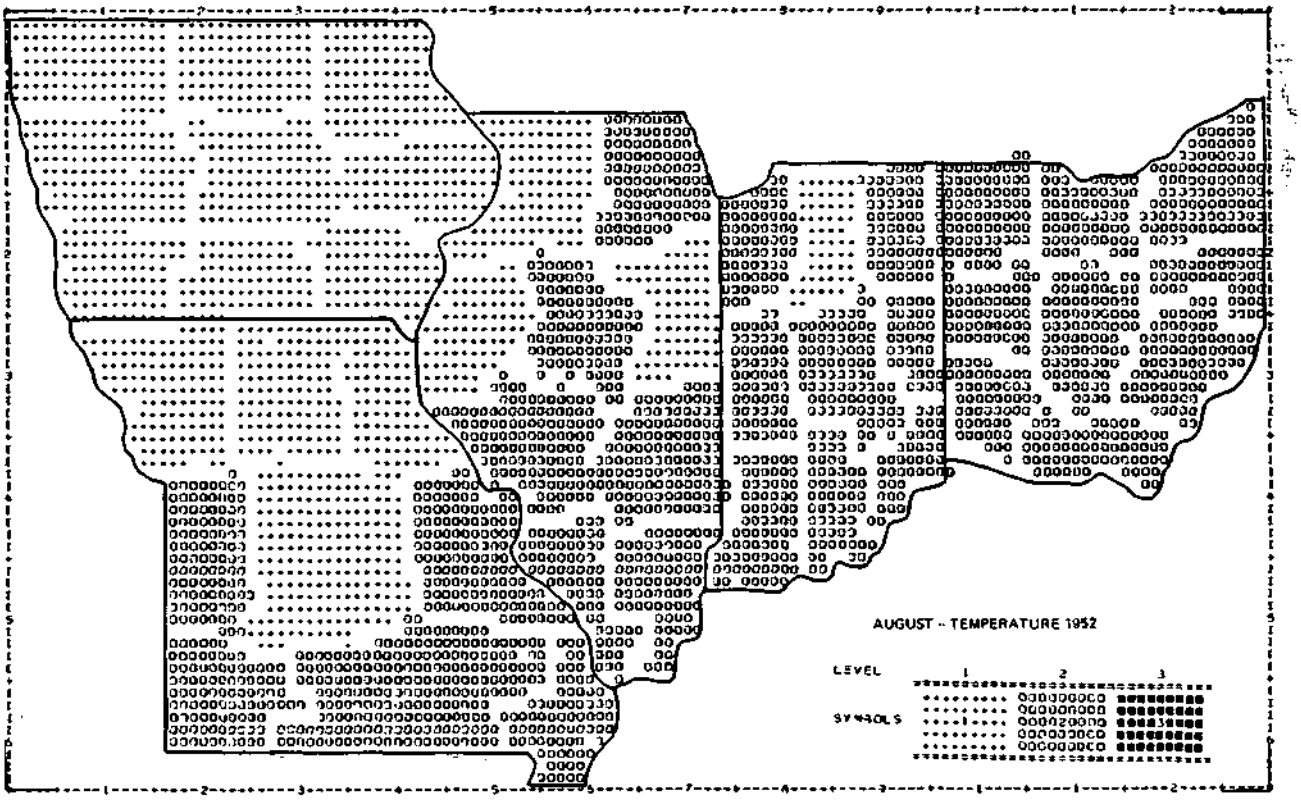
SYMBOLS


AUGUST – TEMPERATURE 1952
LEVEL
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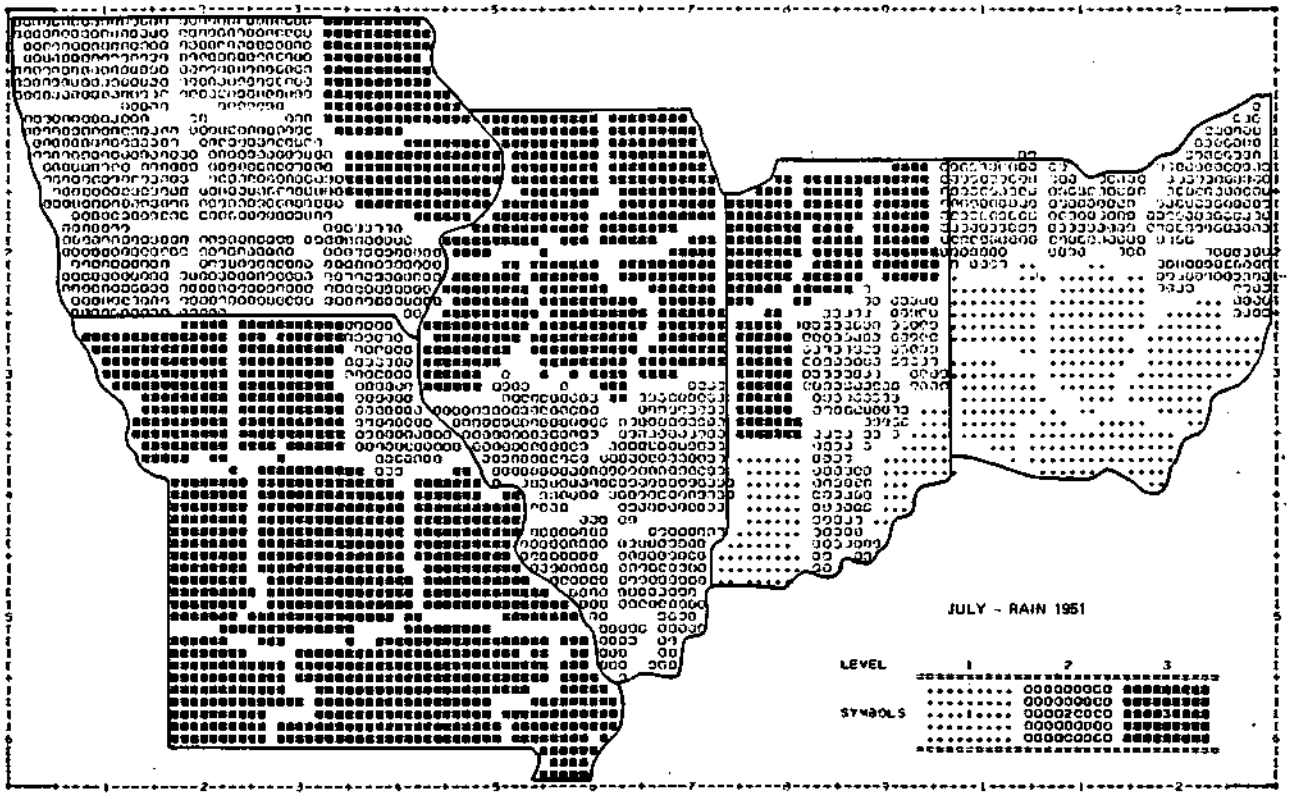
SYMBOLS


JULY - RAIN 1951
LEVEL
1
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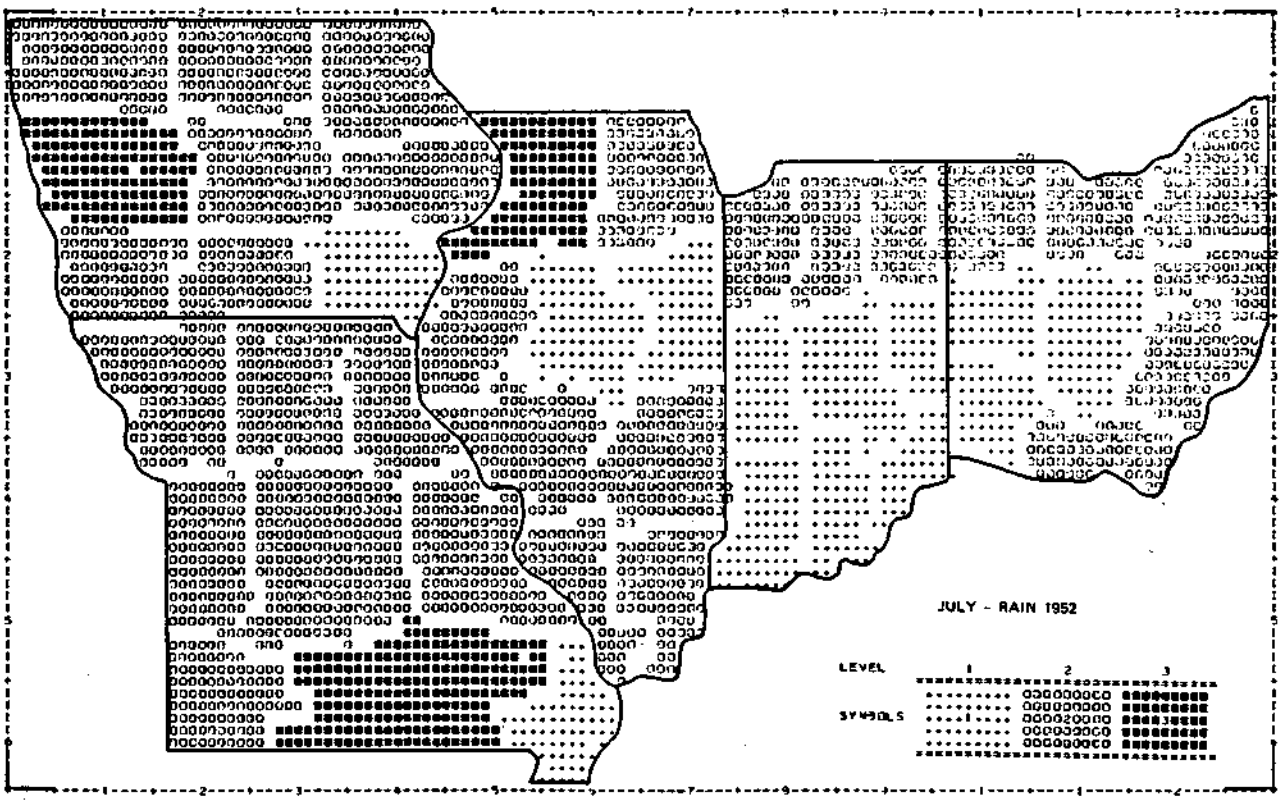
SYMBOLS


JULY - RAIN 1952
LEVEL
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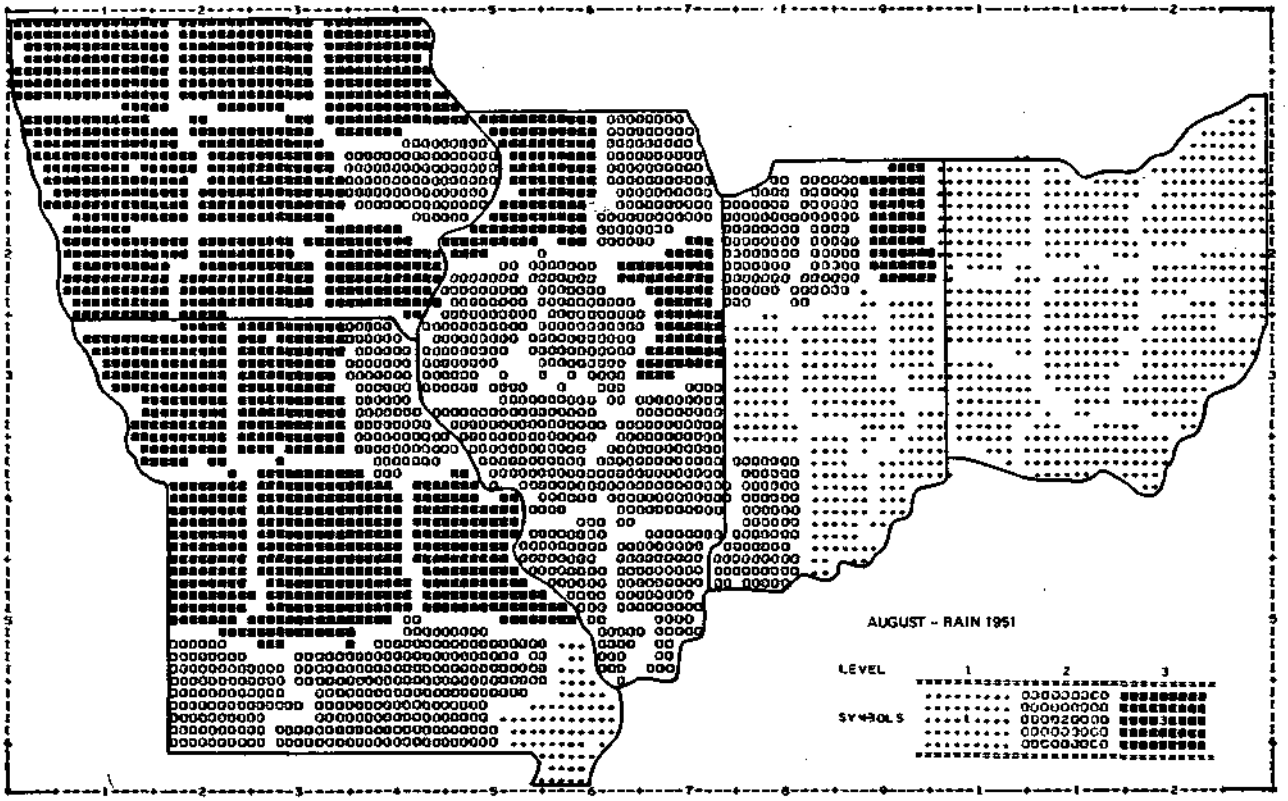
SYMBOLS


AUGUST - RAIN 1951
LEVEL
1
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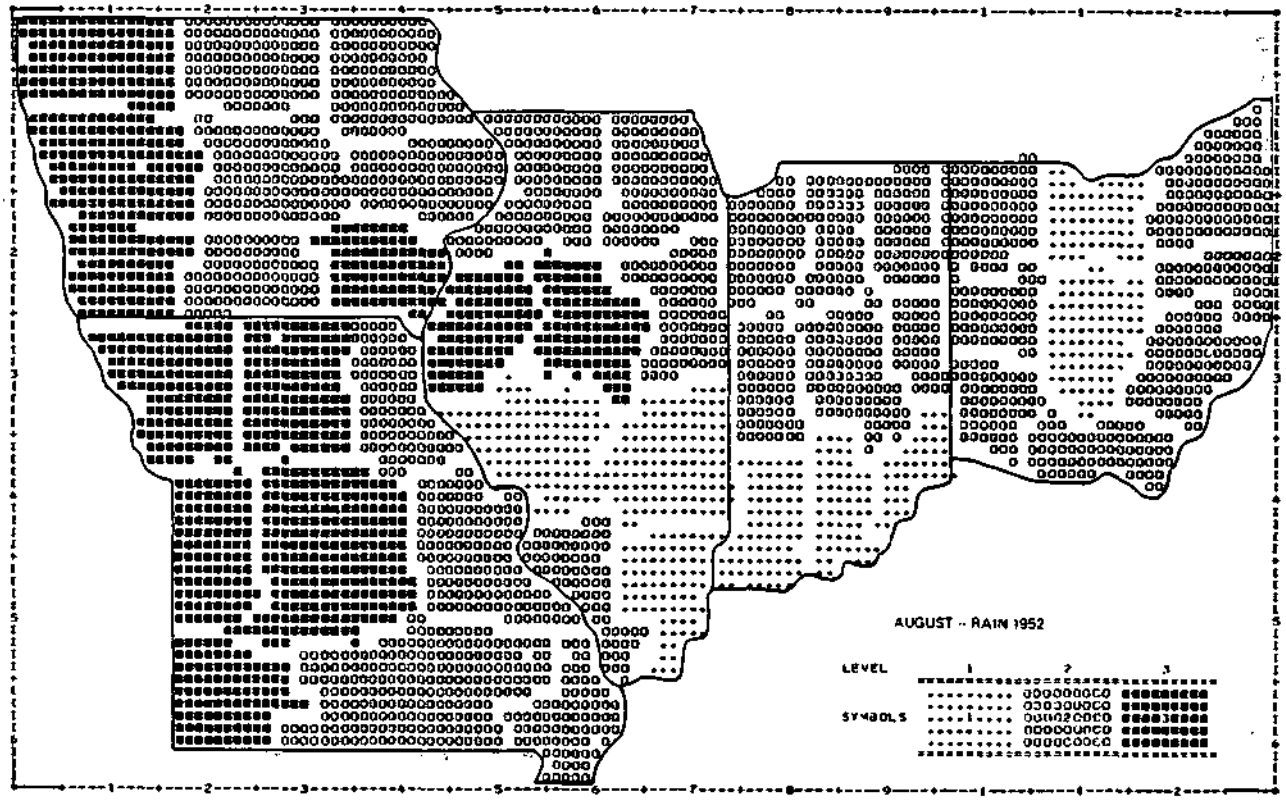
SYMBOLS


AUGUST - RAIN 1952
LEVEL
1
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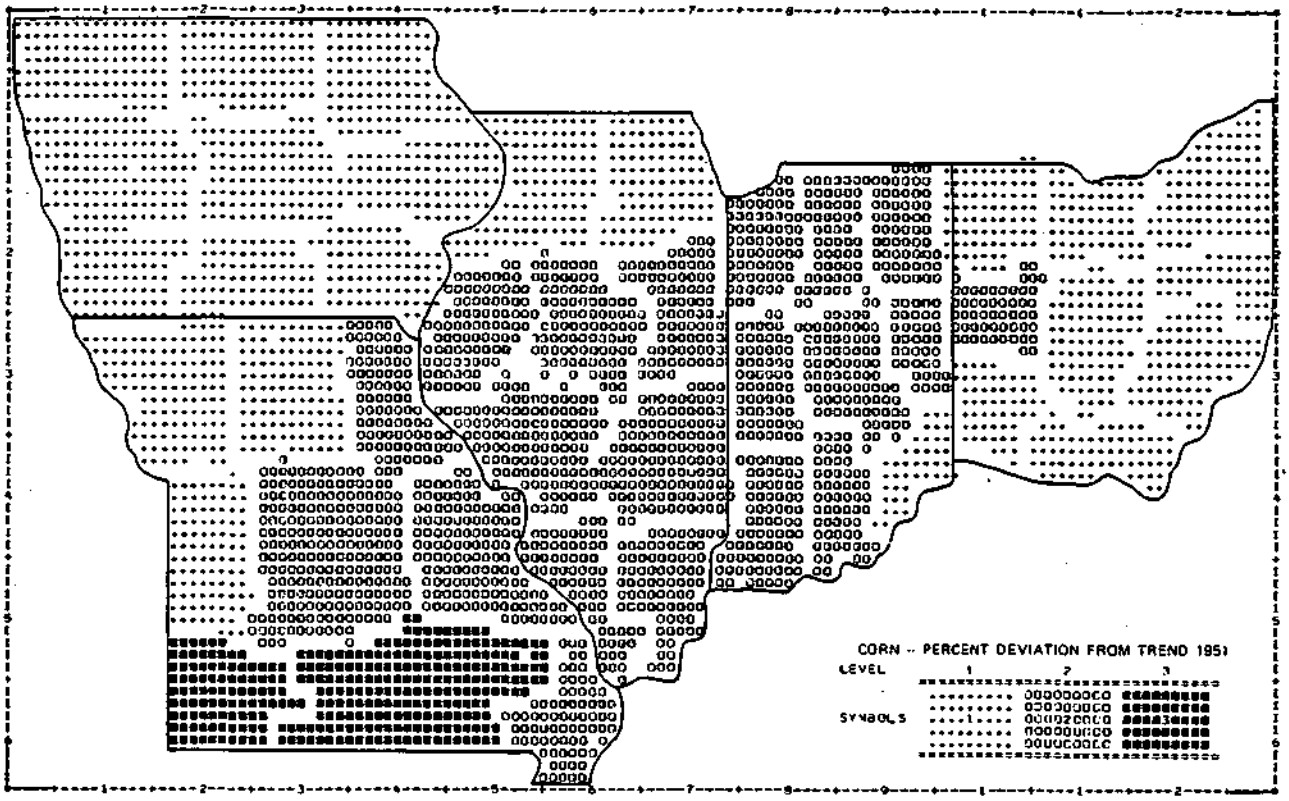
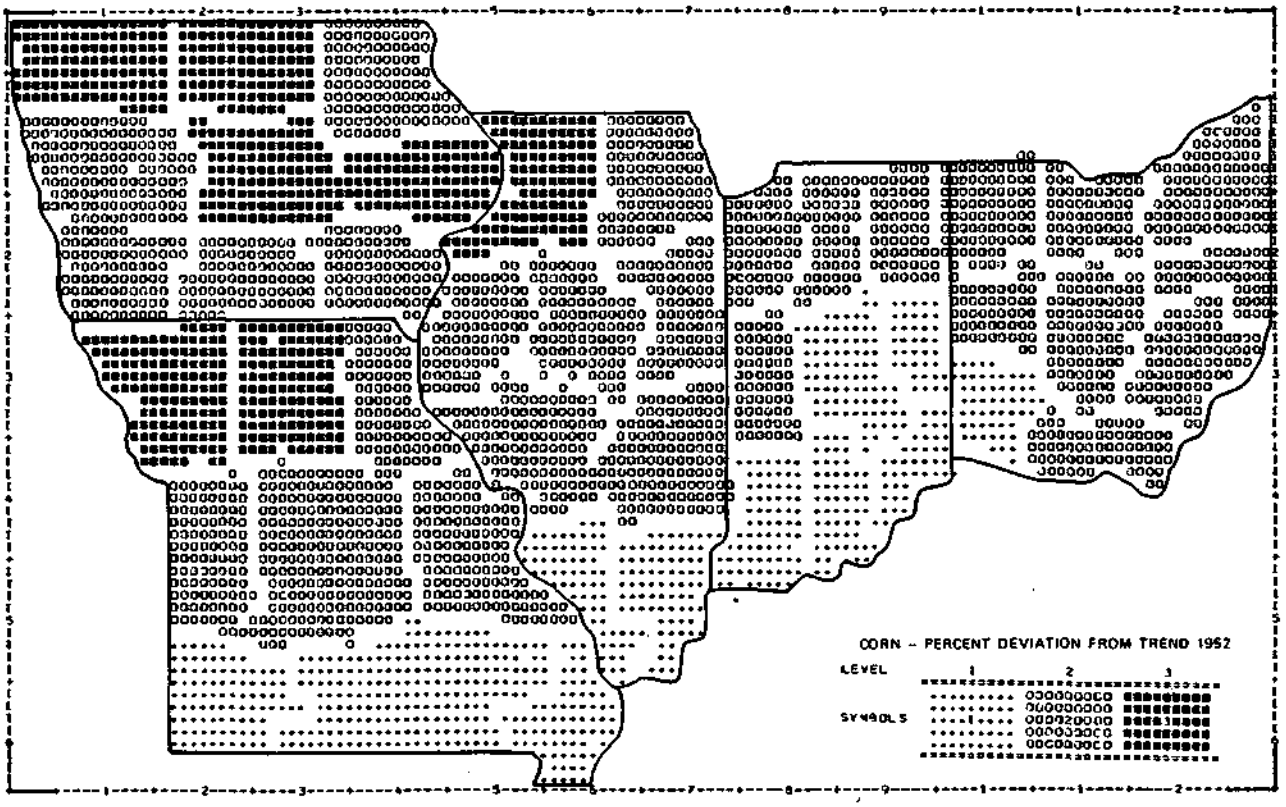
SYMBOLS


CORN -- PERCENT DEVIATION FROM TREND 1951
LEVEL
1
2
3
SYMBOLS


CORN -- PERCENT DEVIATION FROM TREND 1952
LEVEL
1
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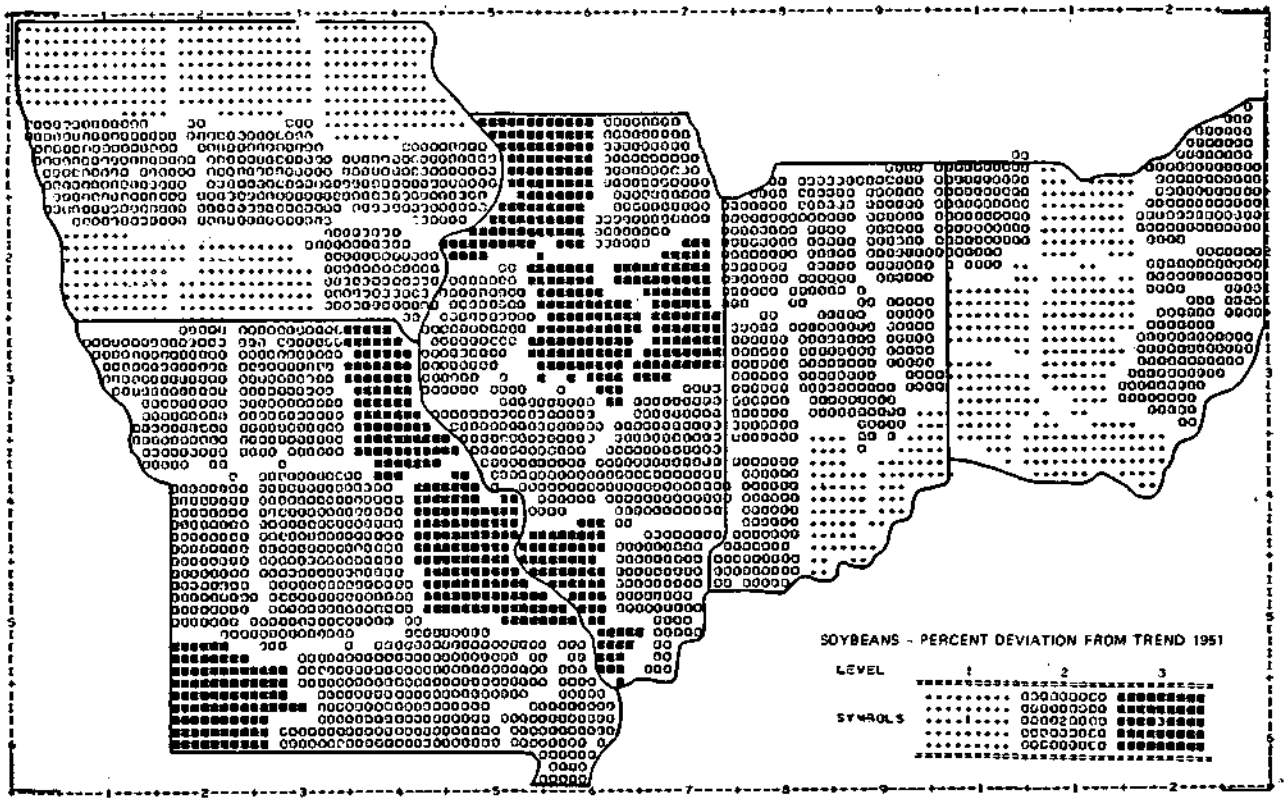
SYMBOLS


SOYBEANS - PERCENT DEVIATION FROM TREND 1951
LEVEL
1
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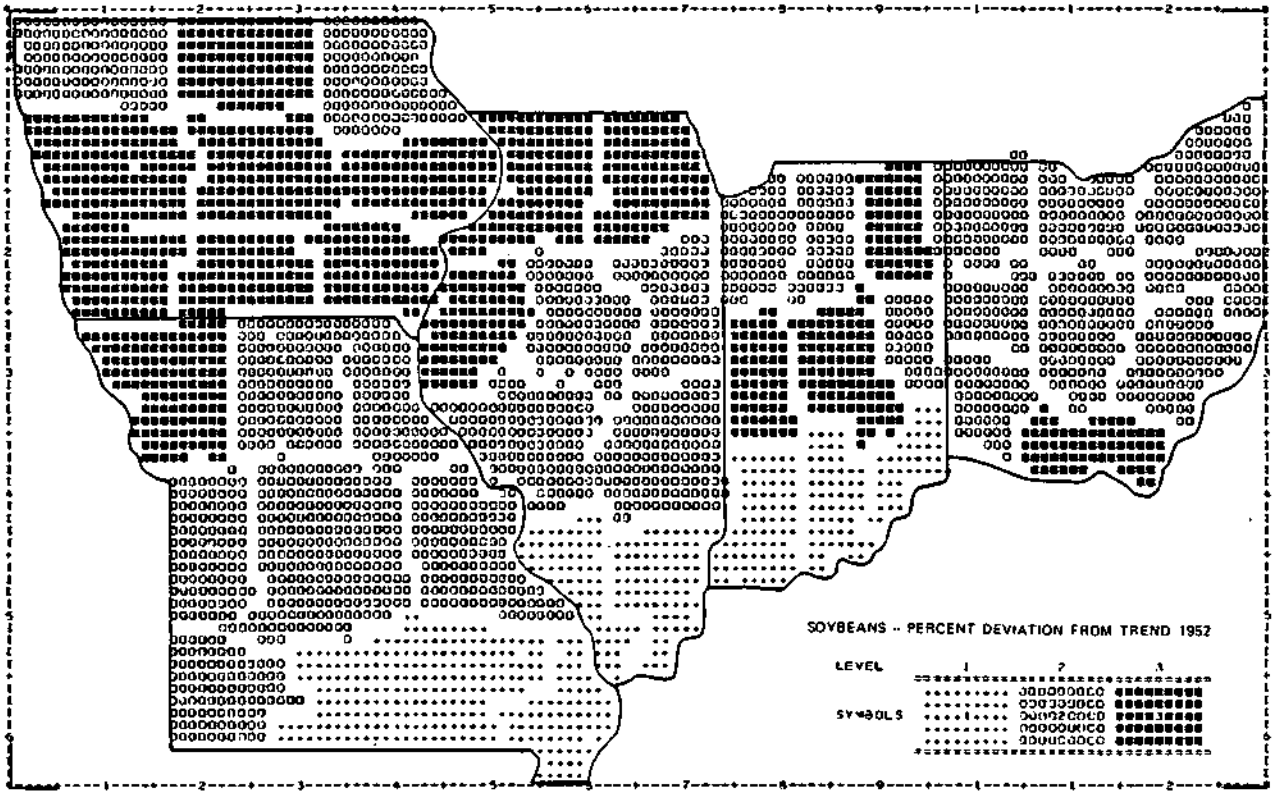
SYMBOLS


SOYBEANS - PERCENT DEVIATION FROM TREND 1952
LEVEL
1
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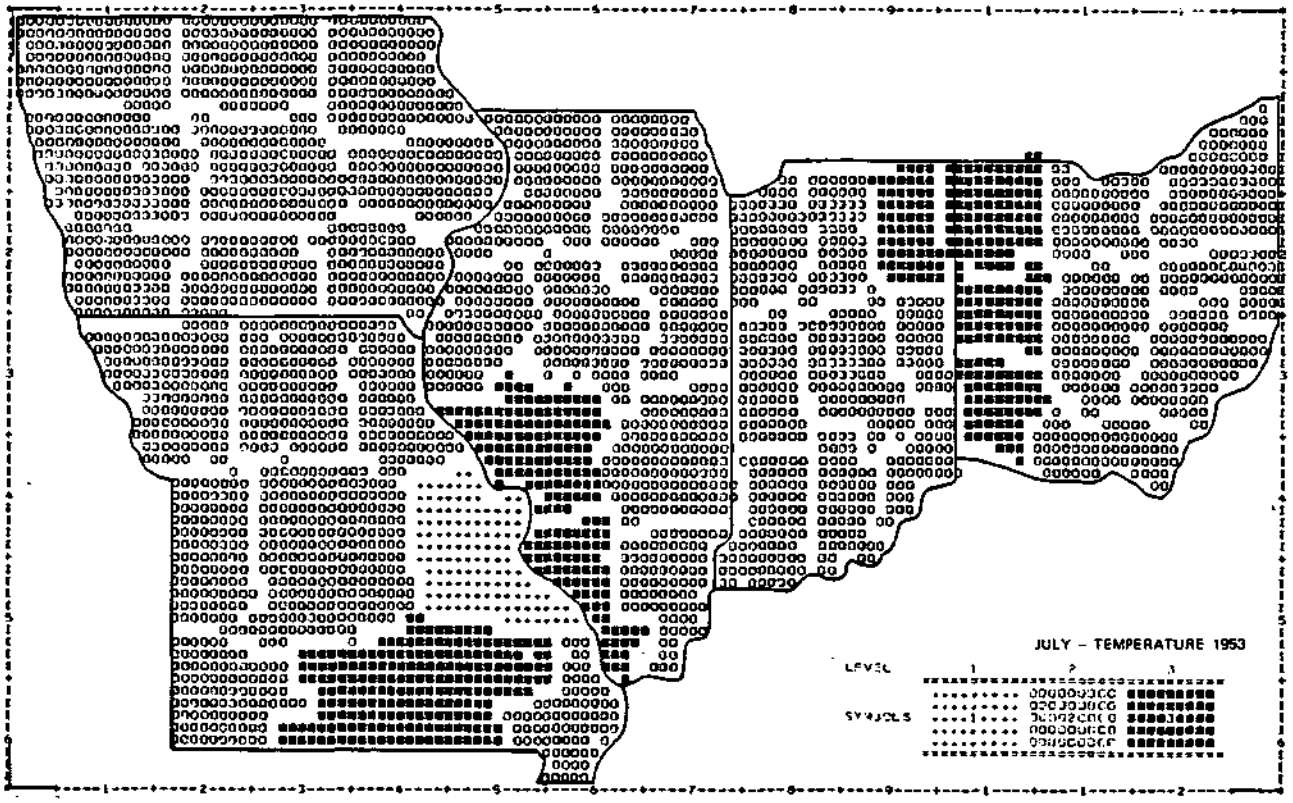
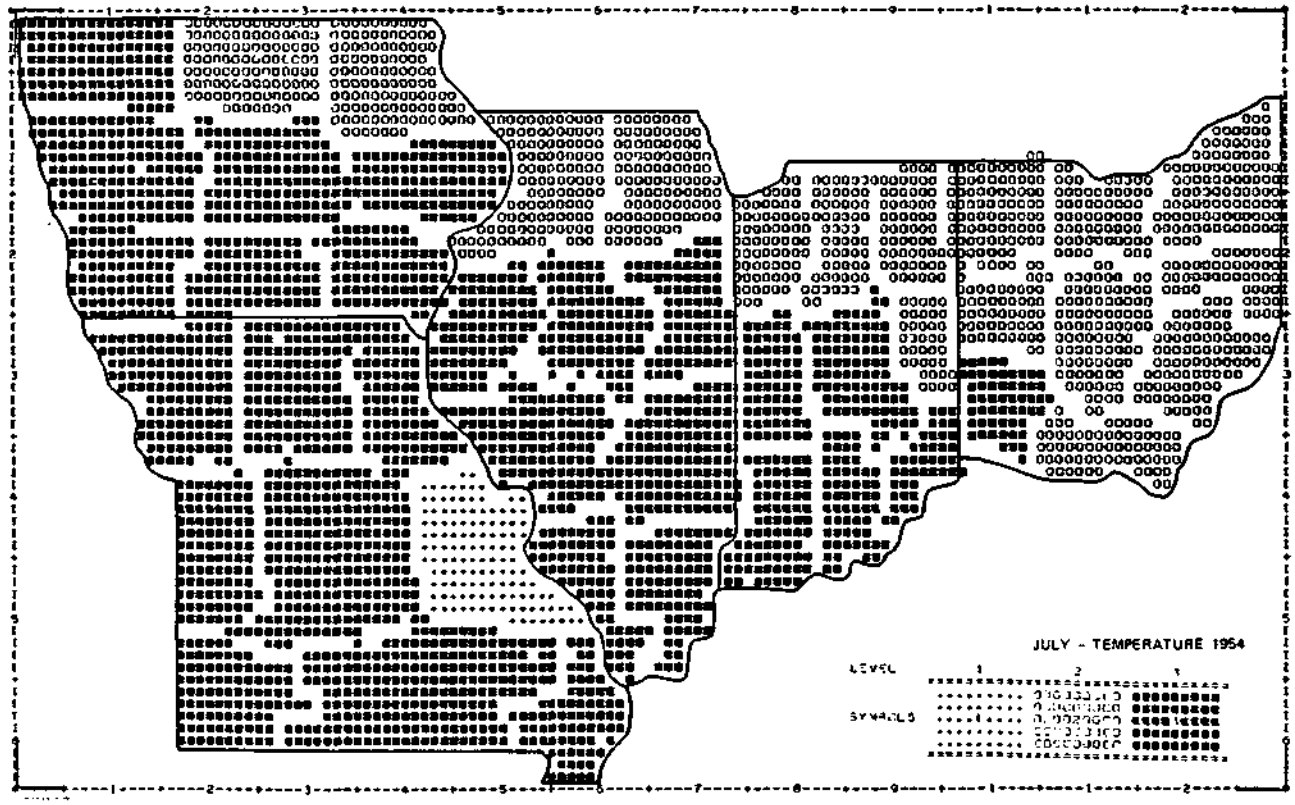
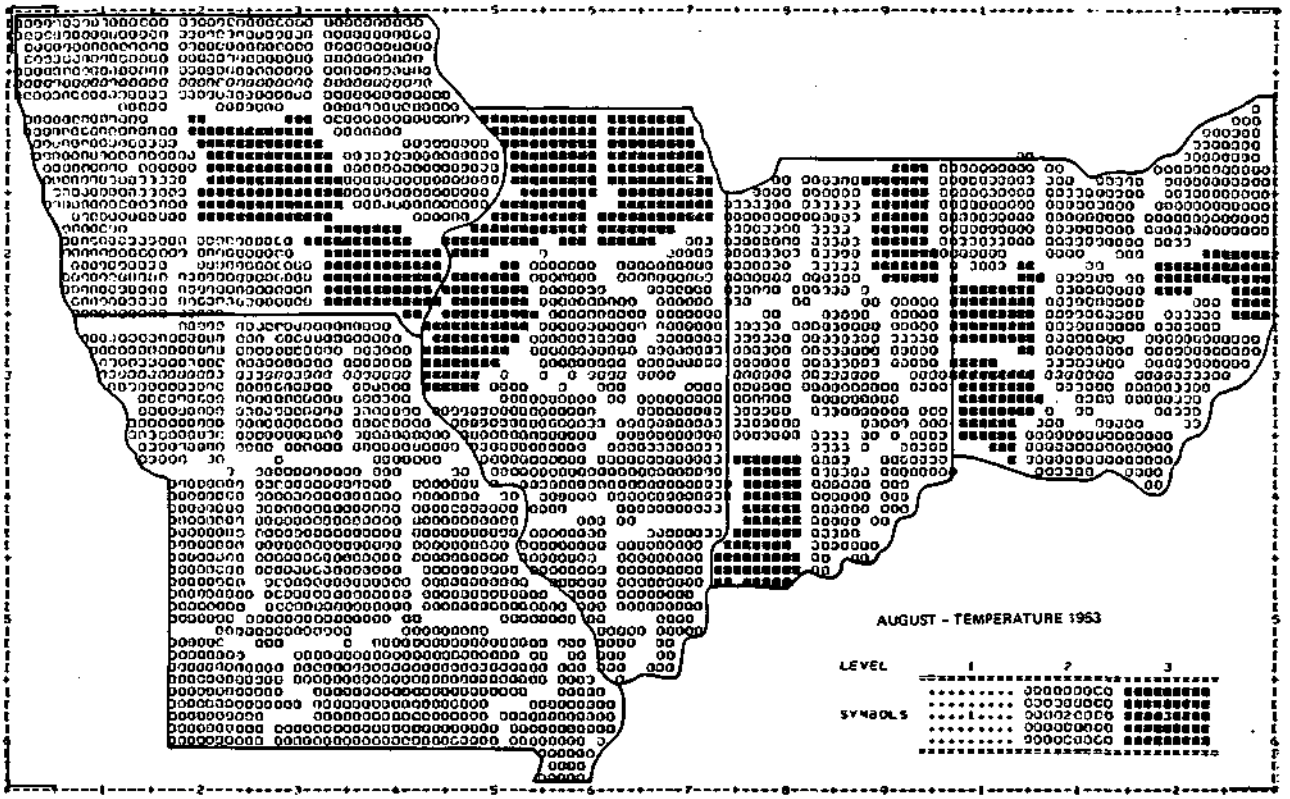
SYMBOLS


JULY - TEMPERATURE 1953
LEVEL
SYMBOLS


JULY - TEMPERATURE 1954
LEVEL
SYMBOLS


AUGUST - TEMPERATURE 1953
LEVEL
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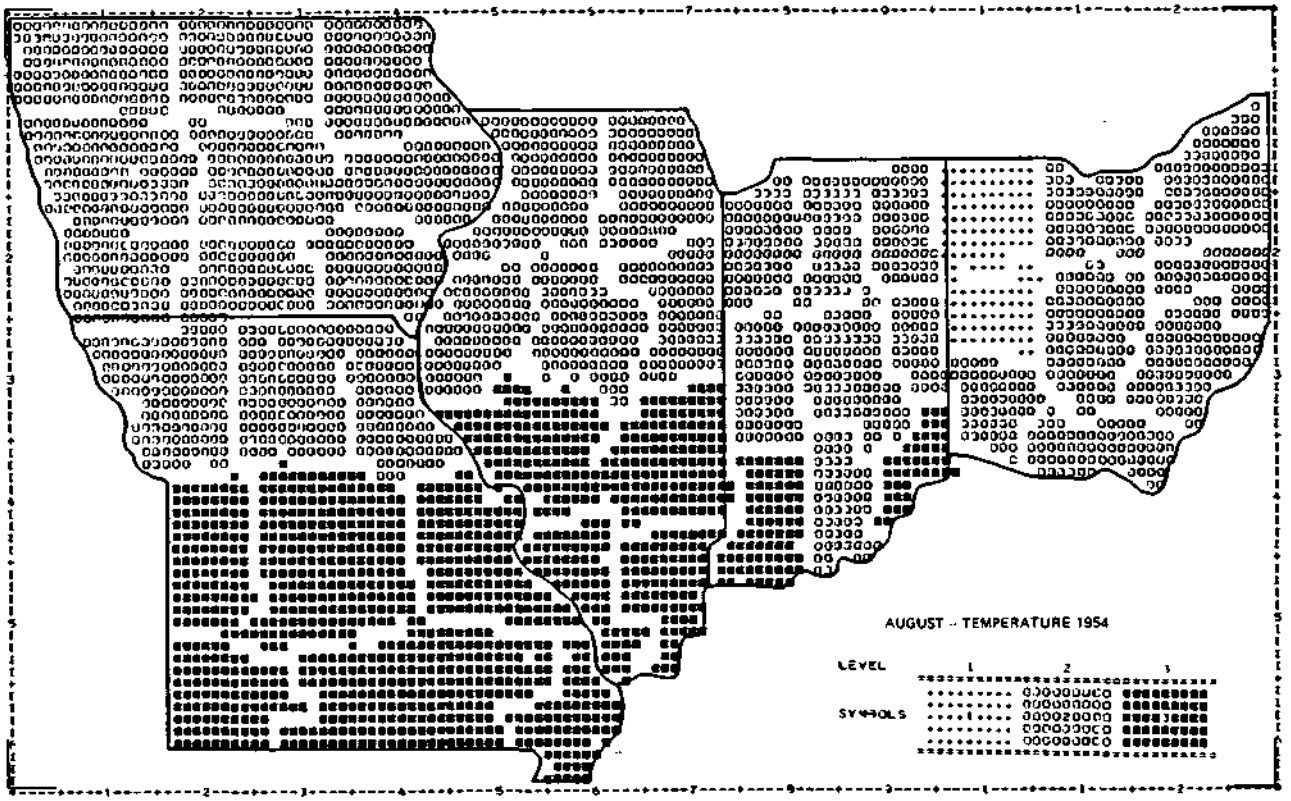
SYMBOLS


AUGUST - TEMPERATURE 1954
LEVEL
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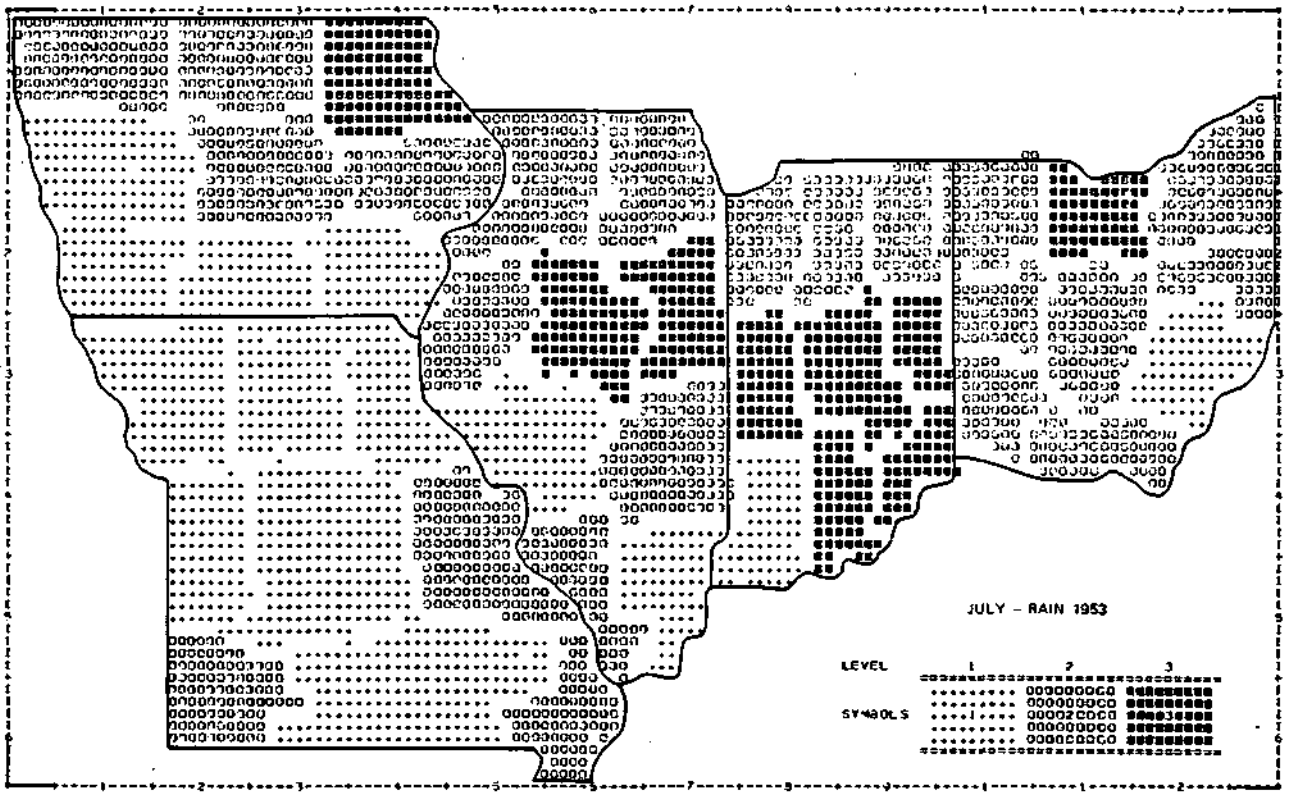
SYMBOLS


JULY - RAIN 1953
LEVEL
1
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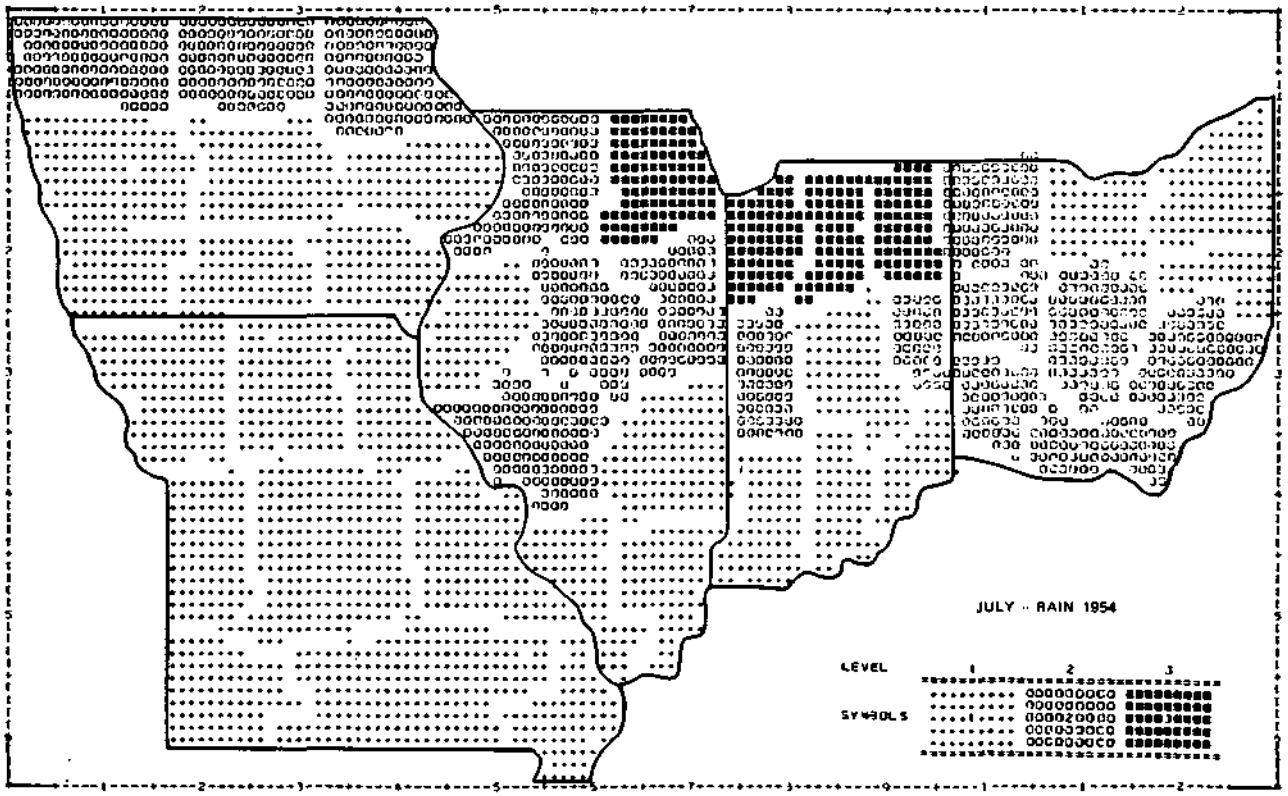
3
SYMBOLS


JULY - RAIN 1954
LEVEL
1
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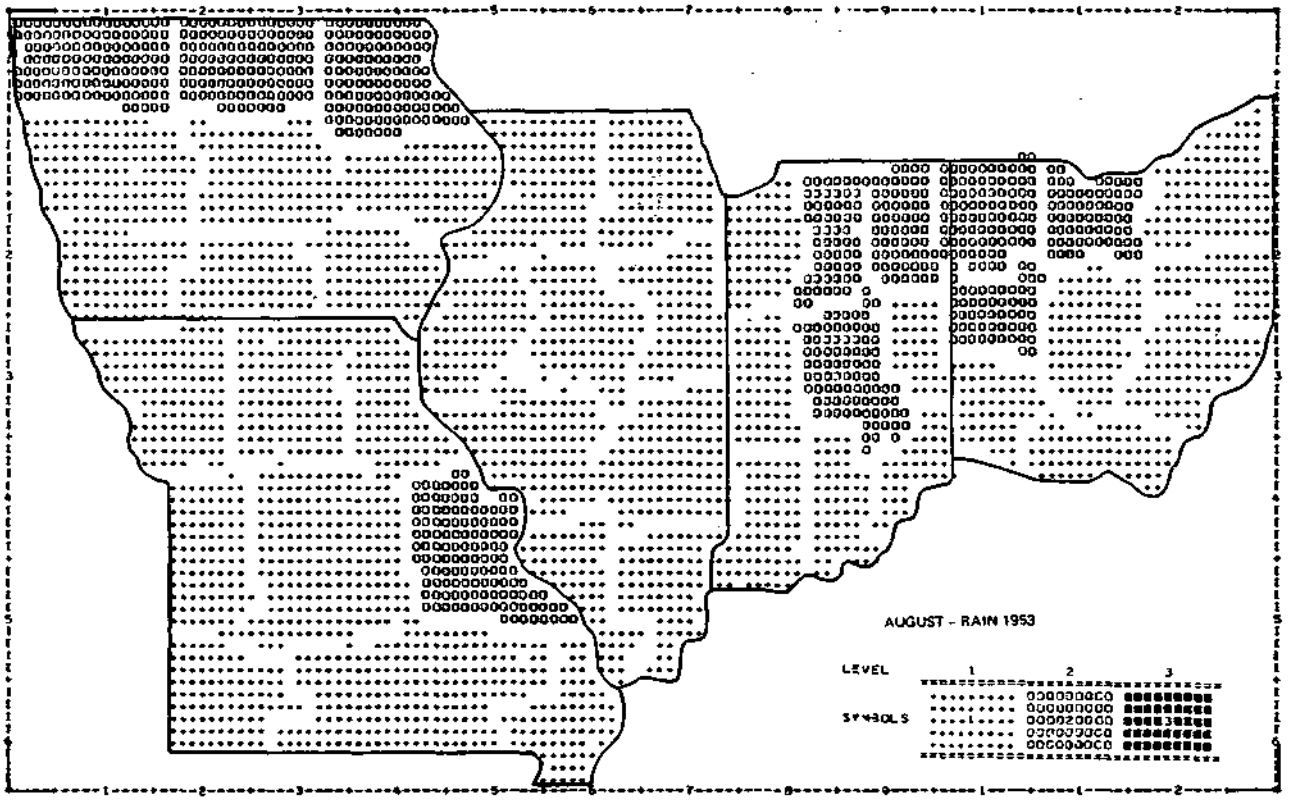
3
SYMBOLS


AUGUST - RAIN 1953
LEVEL
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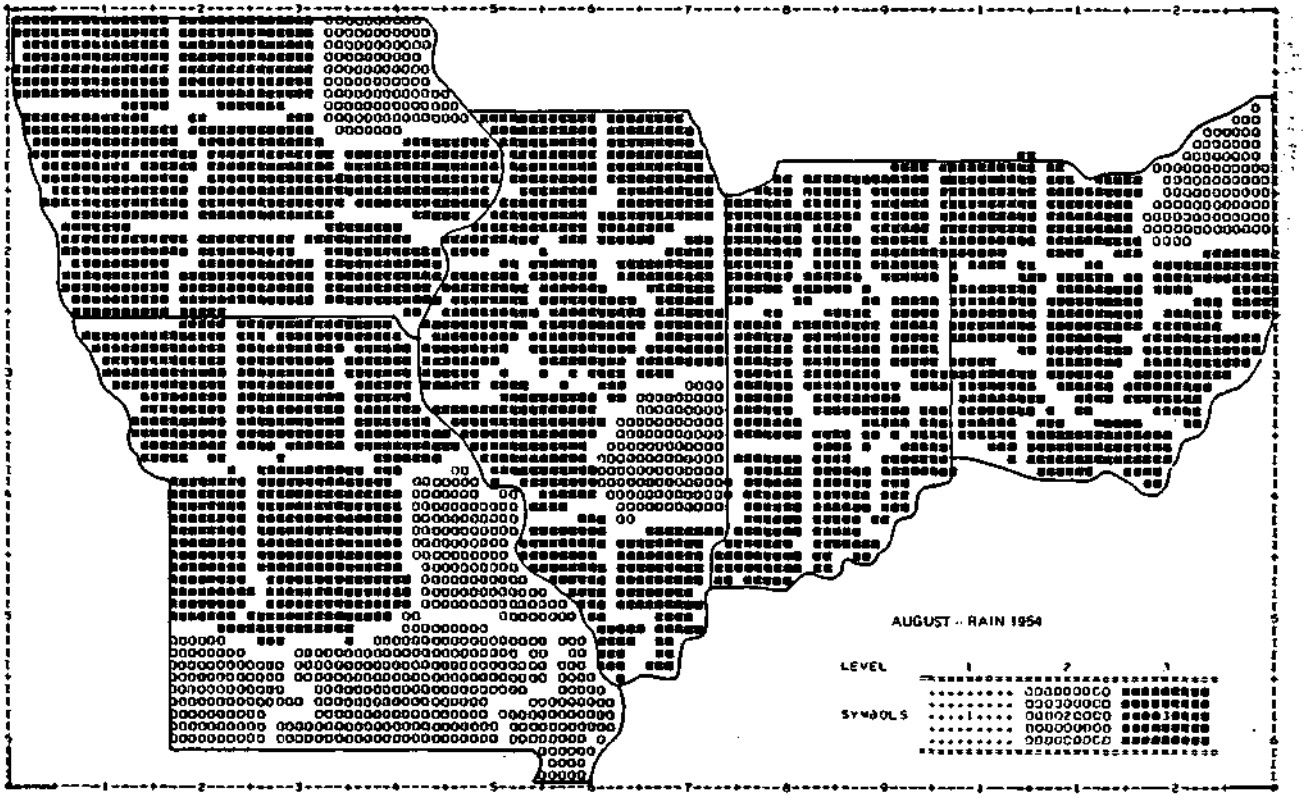
SYMBOLS


AUGUST - RAIN 1954
LEVEL
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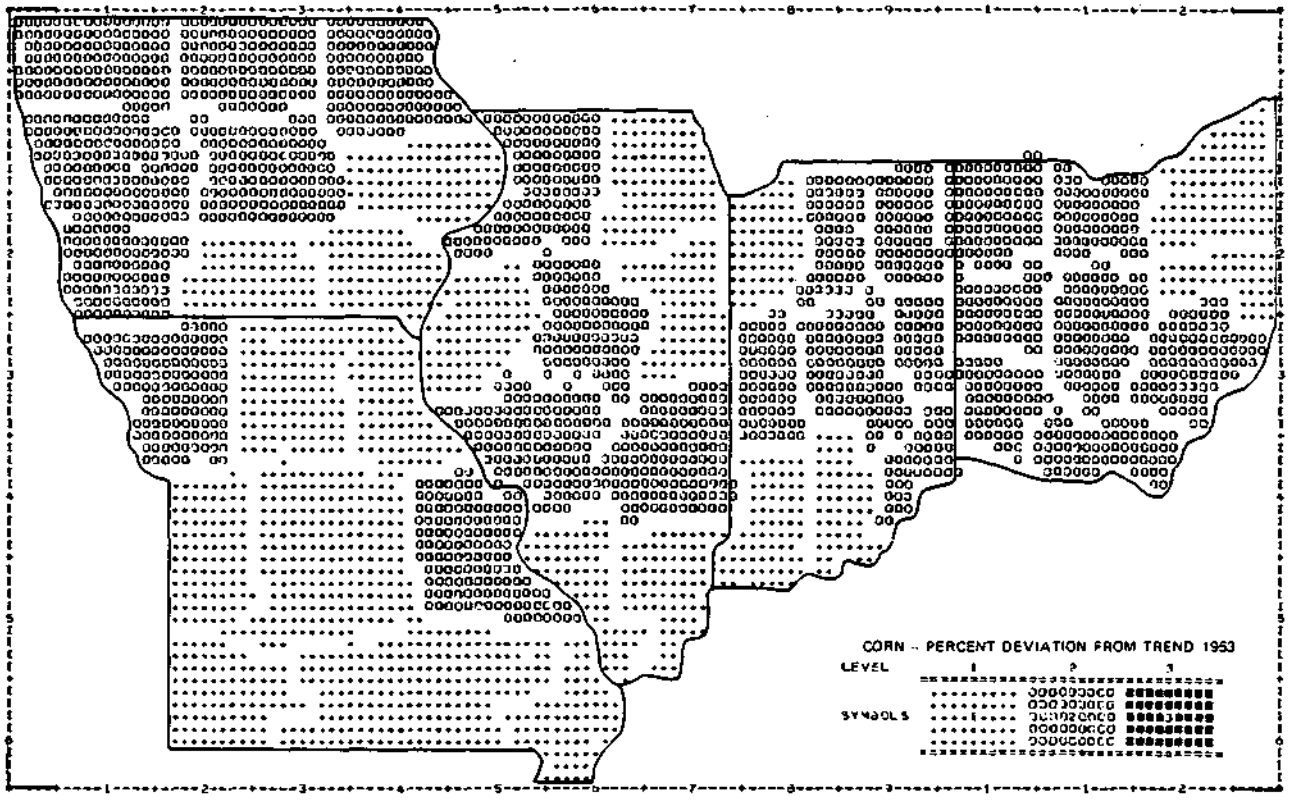
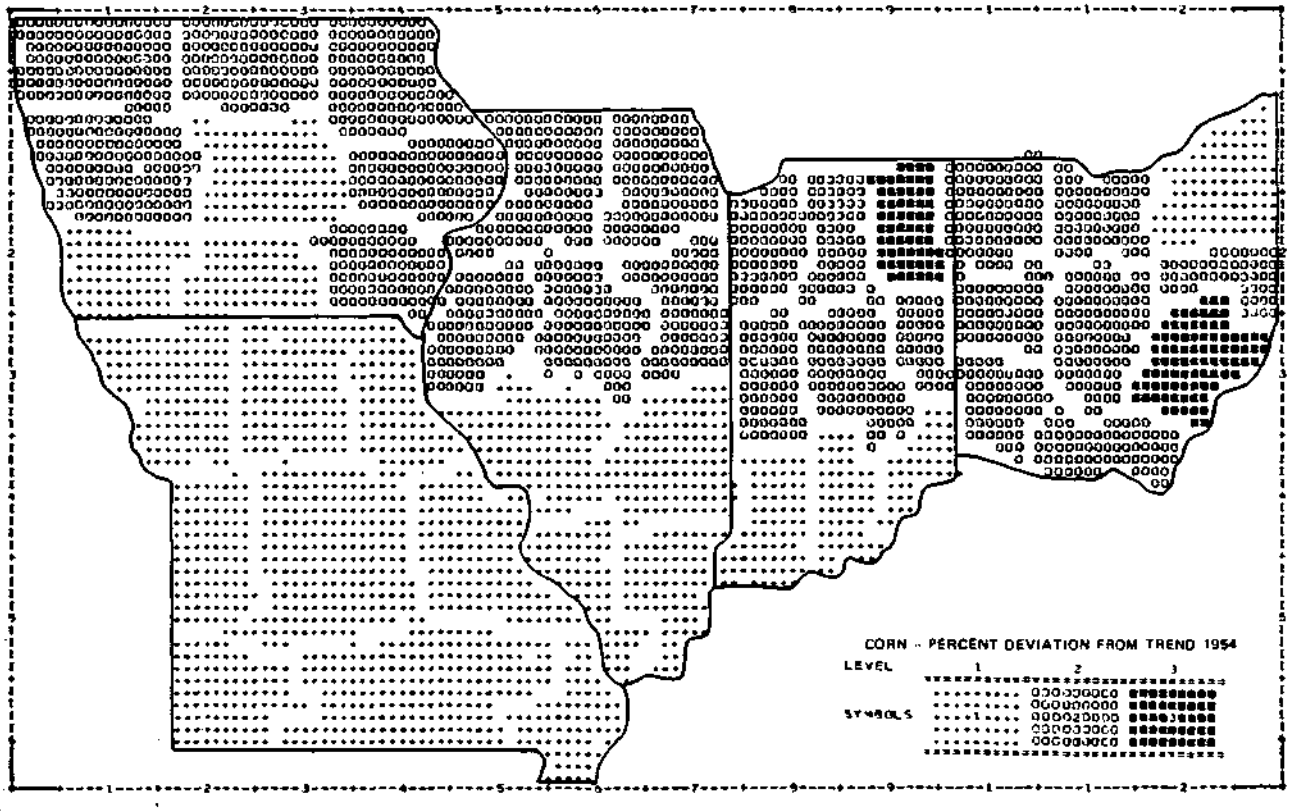
SYMBOLS


CORN - PERCENT DEVIATION FROM TREND 1953
LEVEL
1
2
3
SYMBOLS


CORN - PERCENT DEVIATION FROM TREND 1954
LEVEL
1
2
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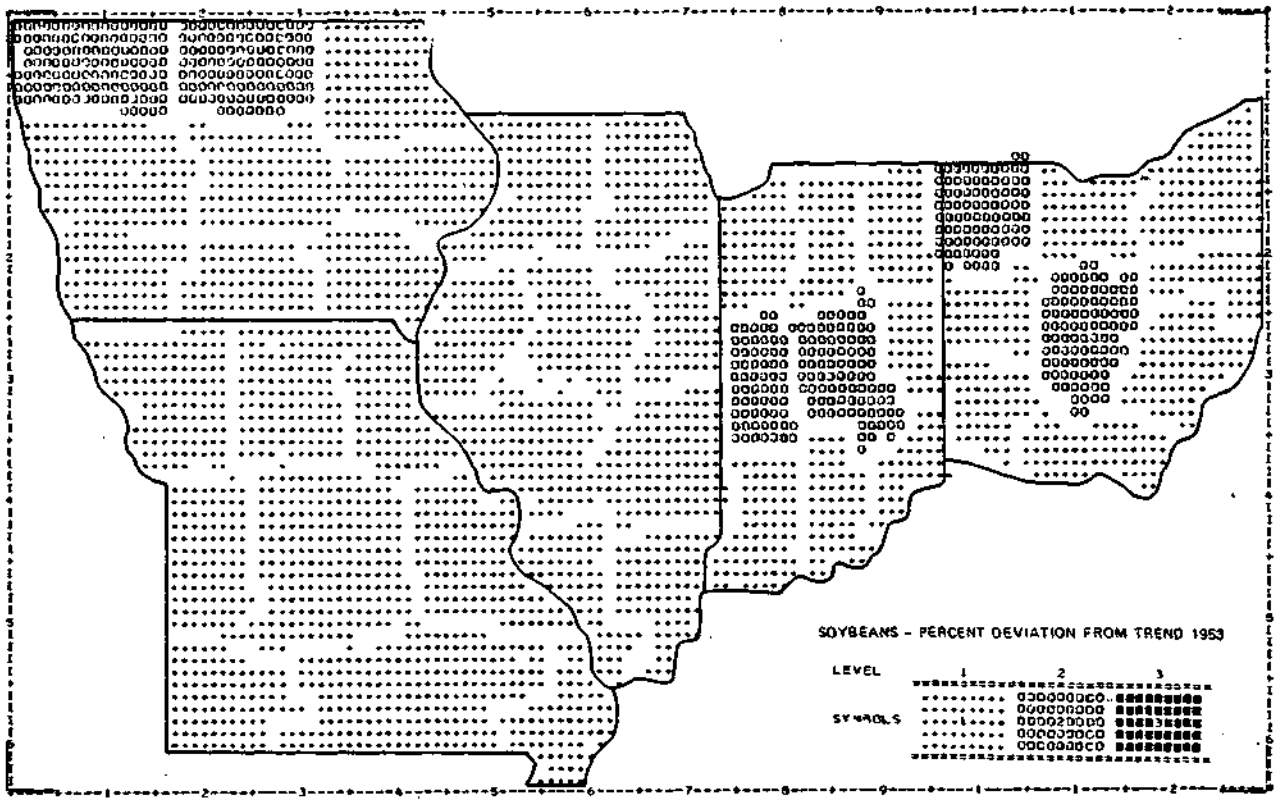
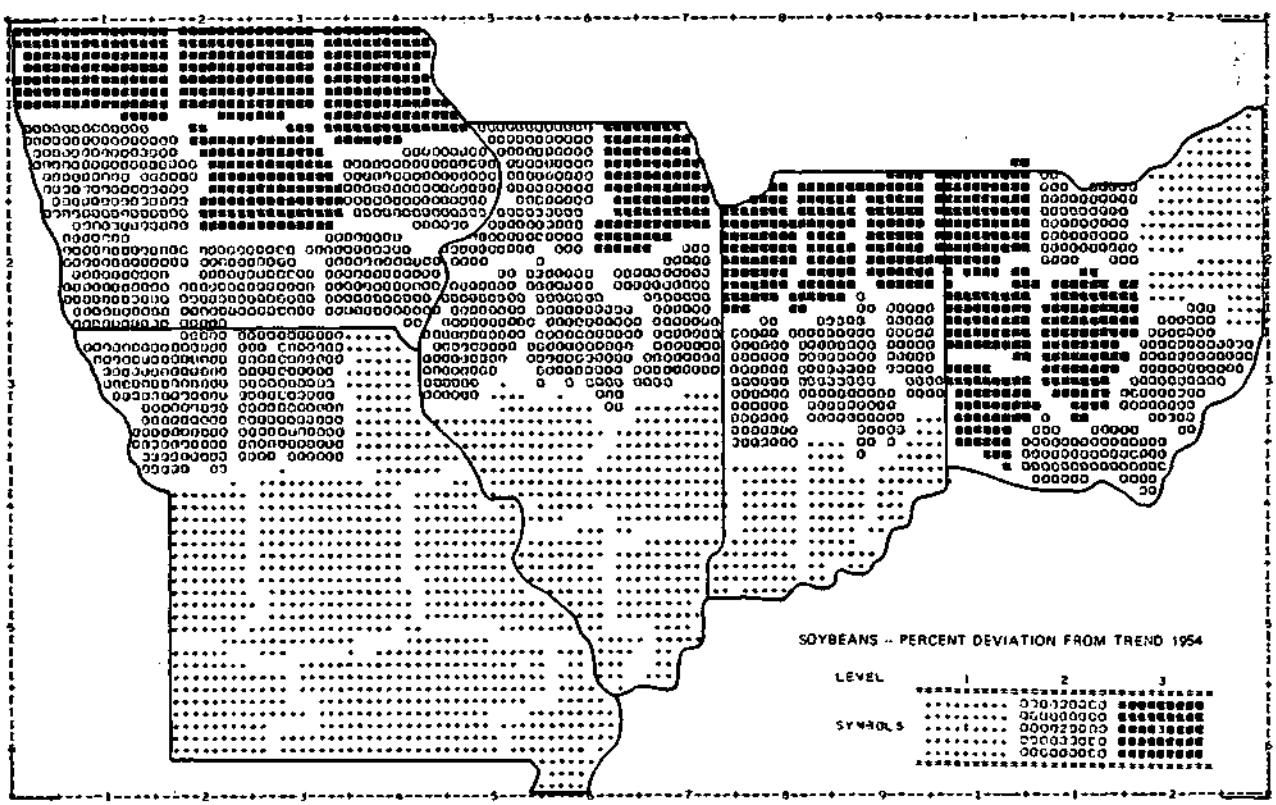
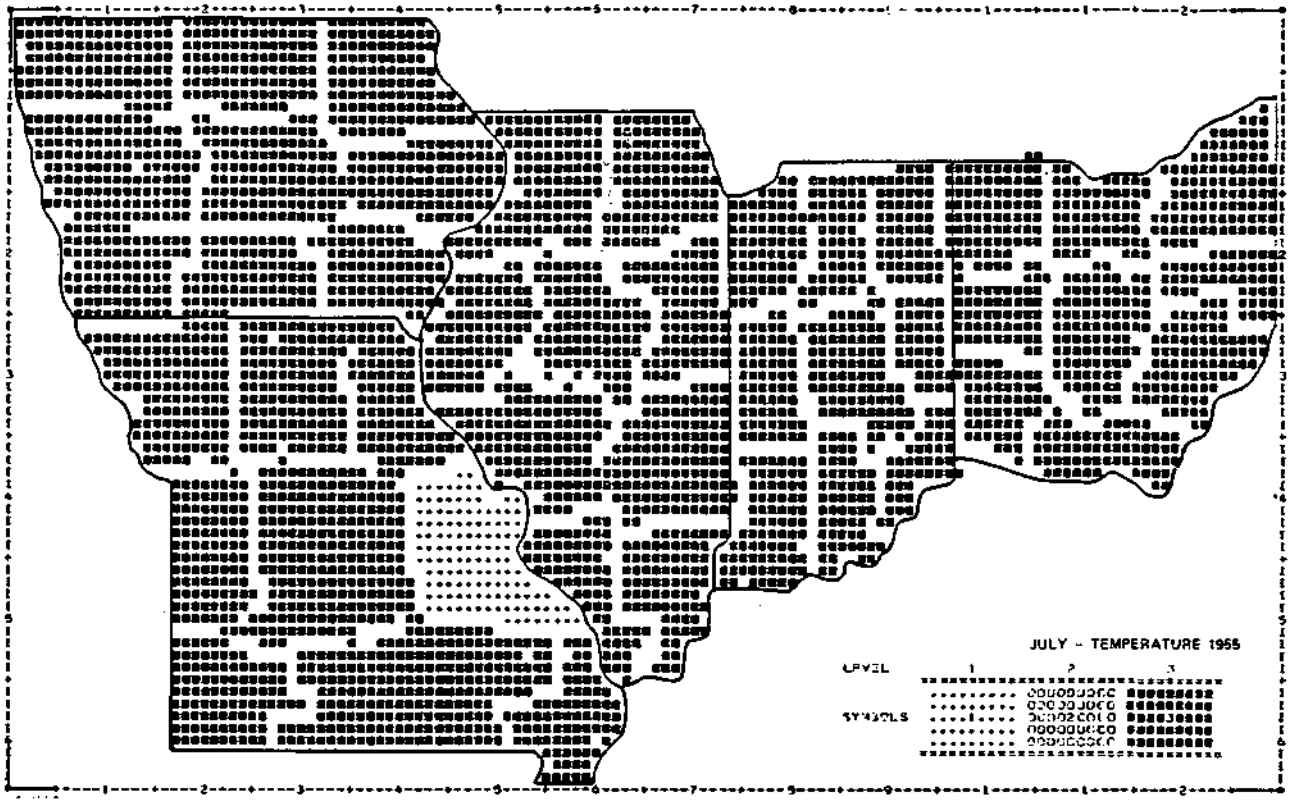
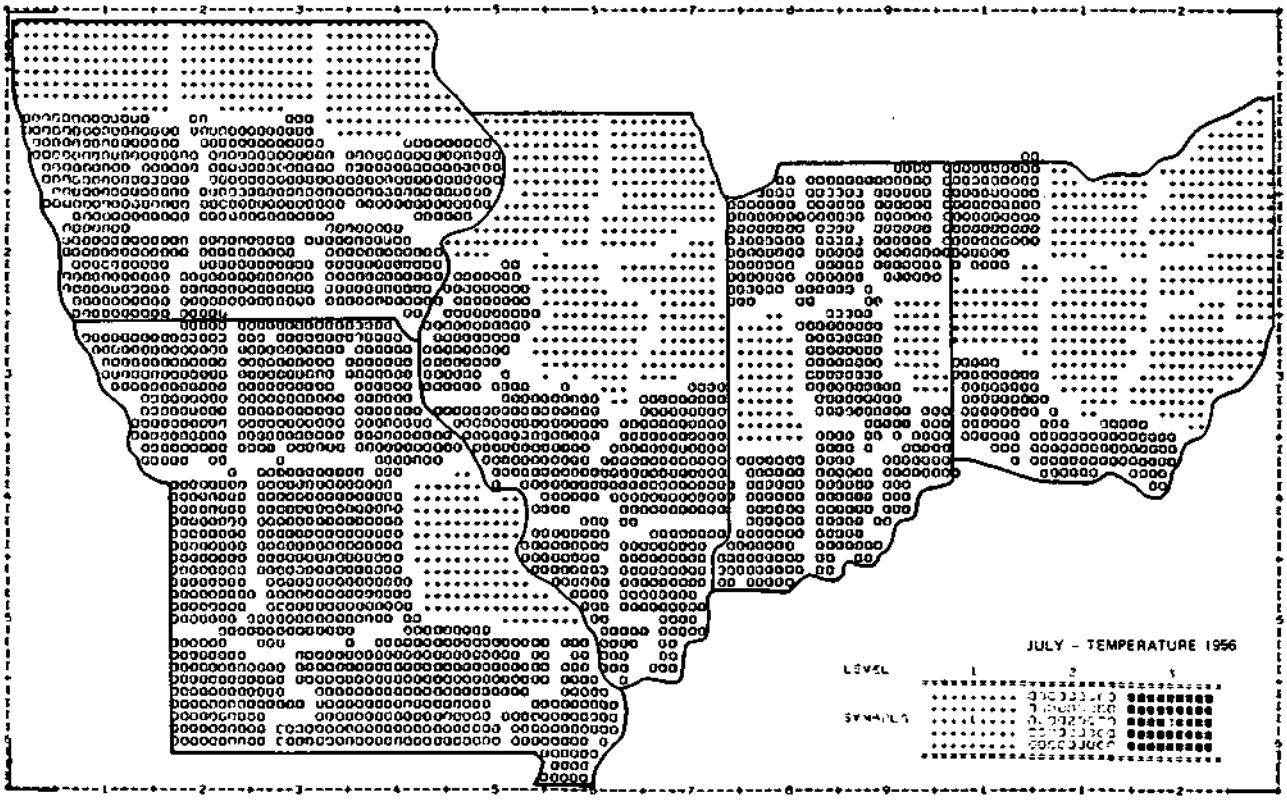
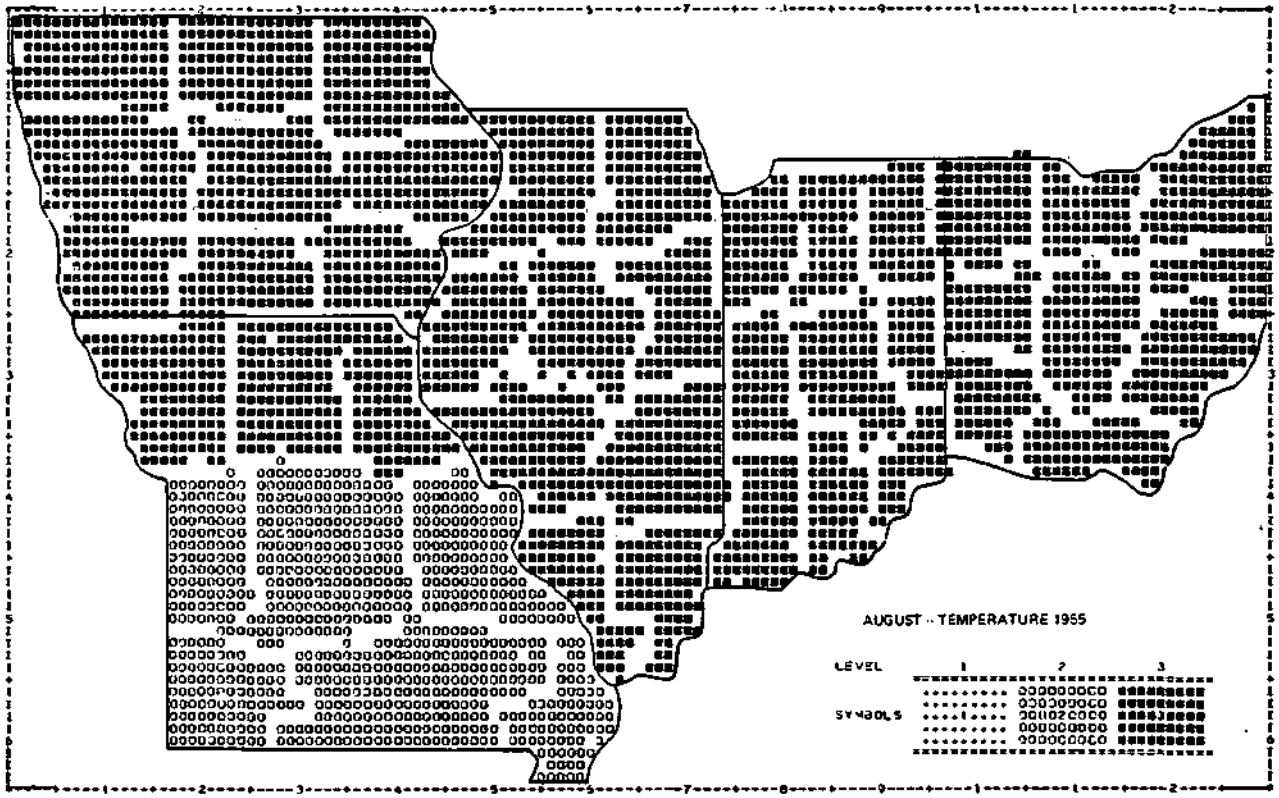
SYMBOLS

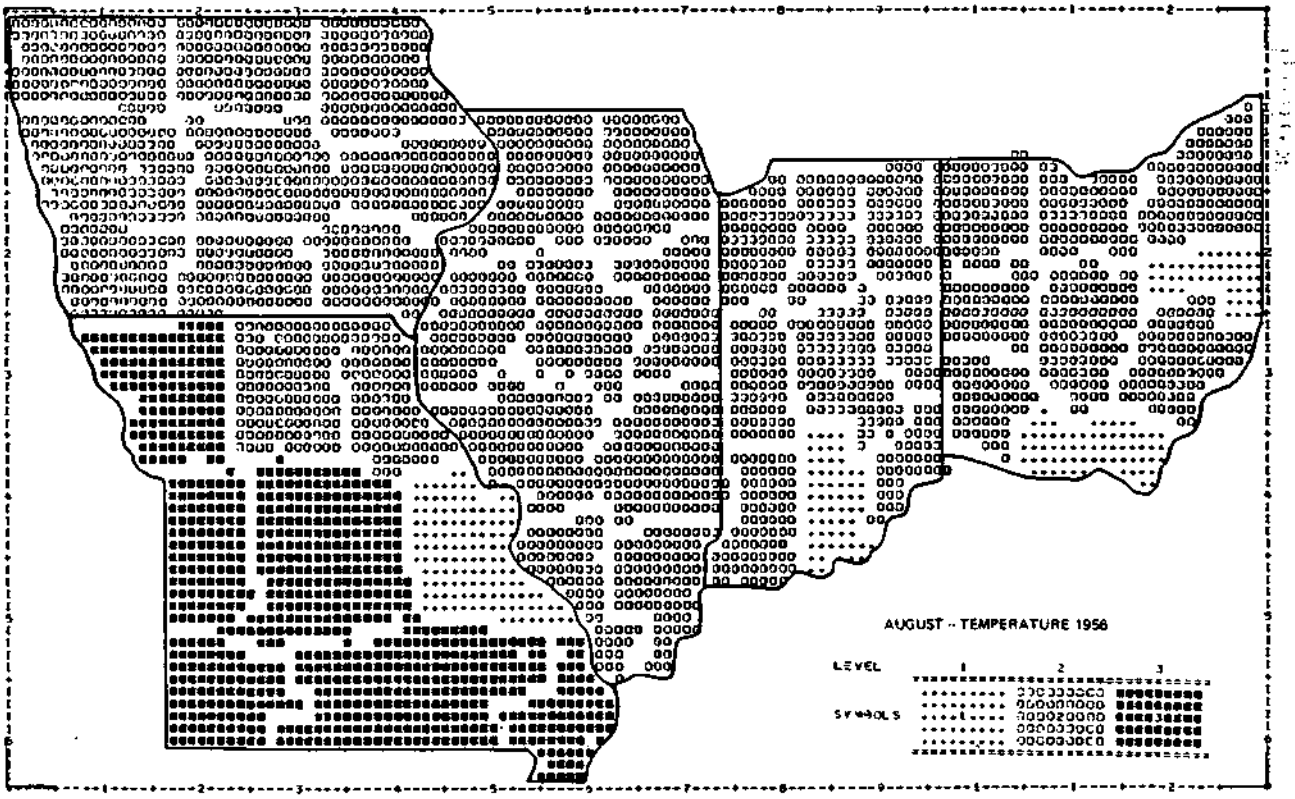

SOYBEANS - PERCENT DEVIATION FROM TREND 1953
LEVEL
1
2
3
SYMBOLS

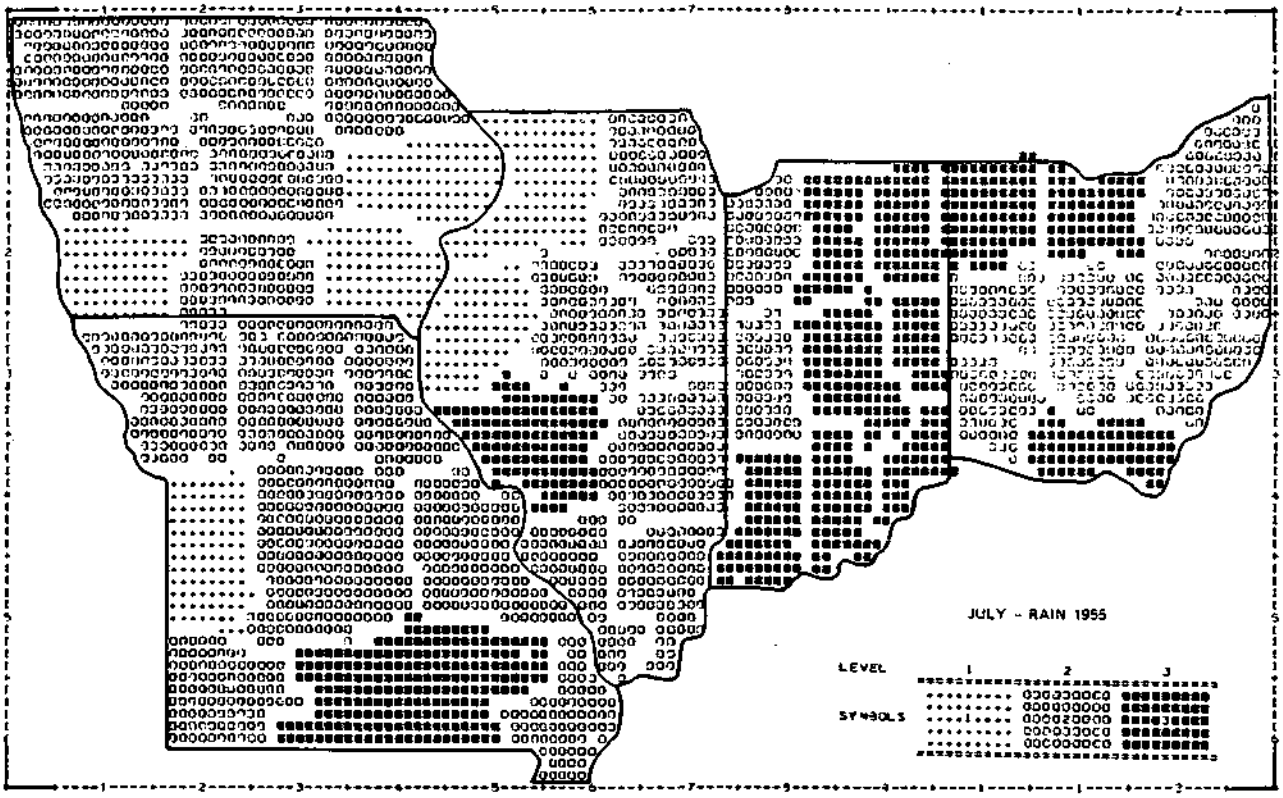

SOYBEANS - PERCENT DEVIATION FROM TREND 1954
LEVEL
1
2
3
SYMBOLS

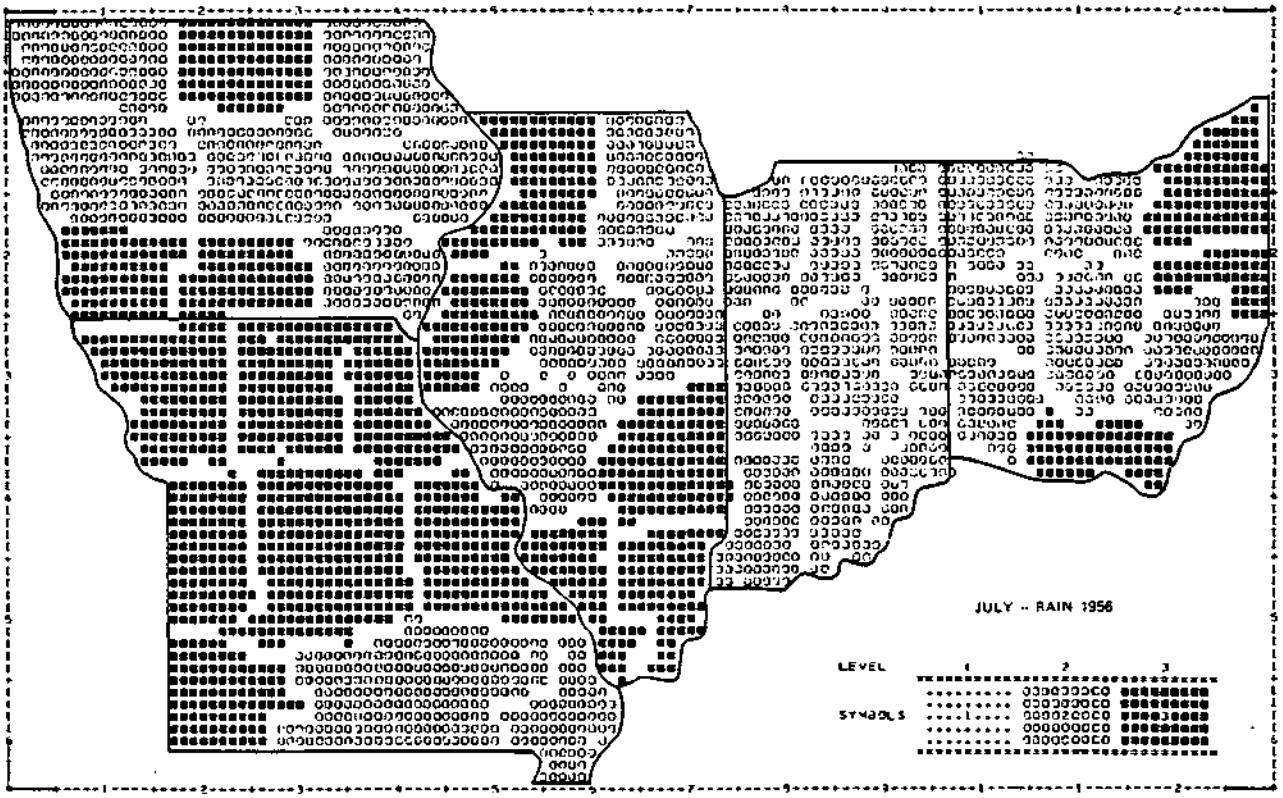

JULY - TEMPERATURE 1955

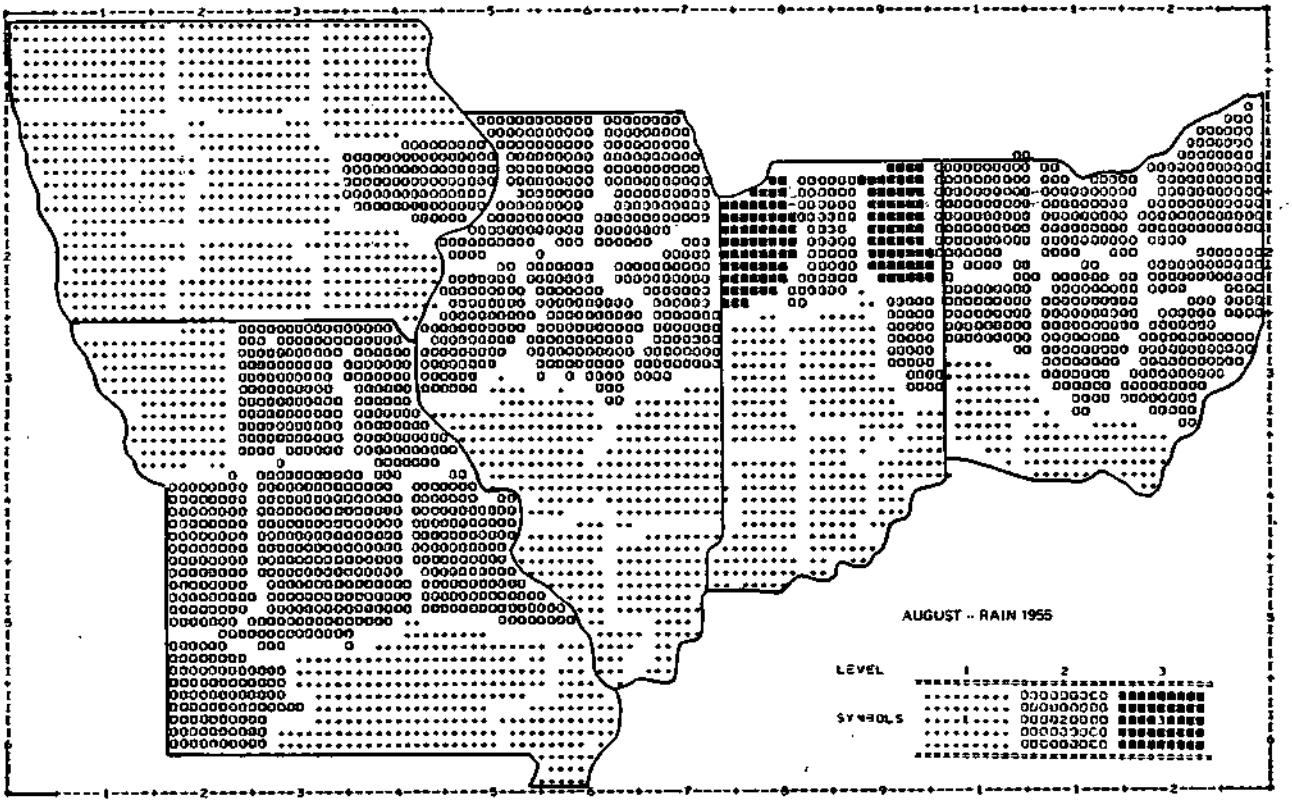

JULY - TEMPERATURE 1956

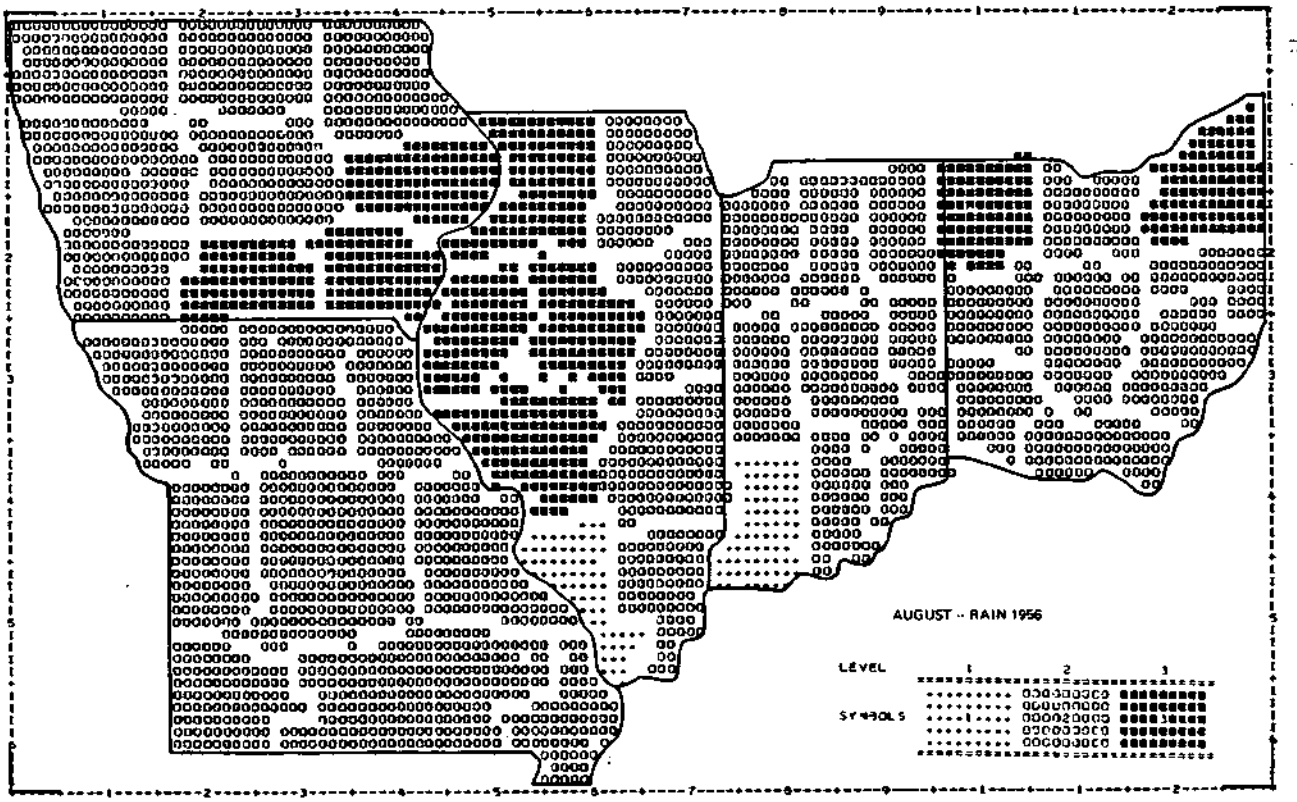

AUGUST -- TEMPERATURE 1955
LEVEL
SYMBOLS

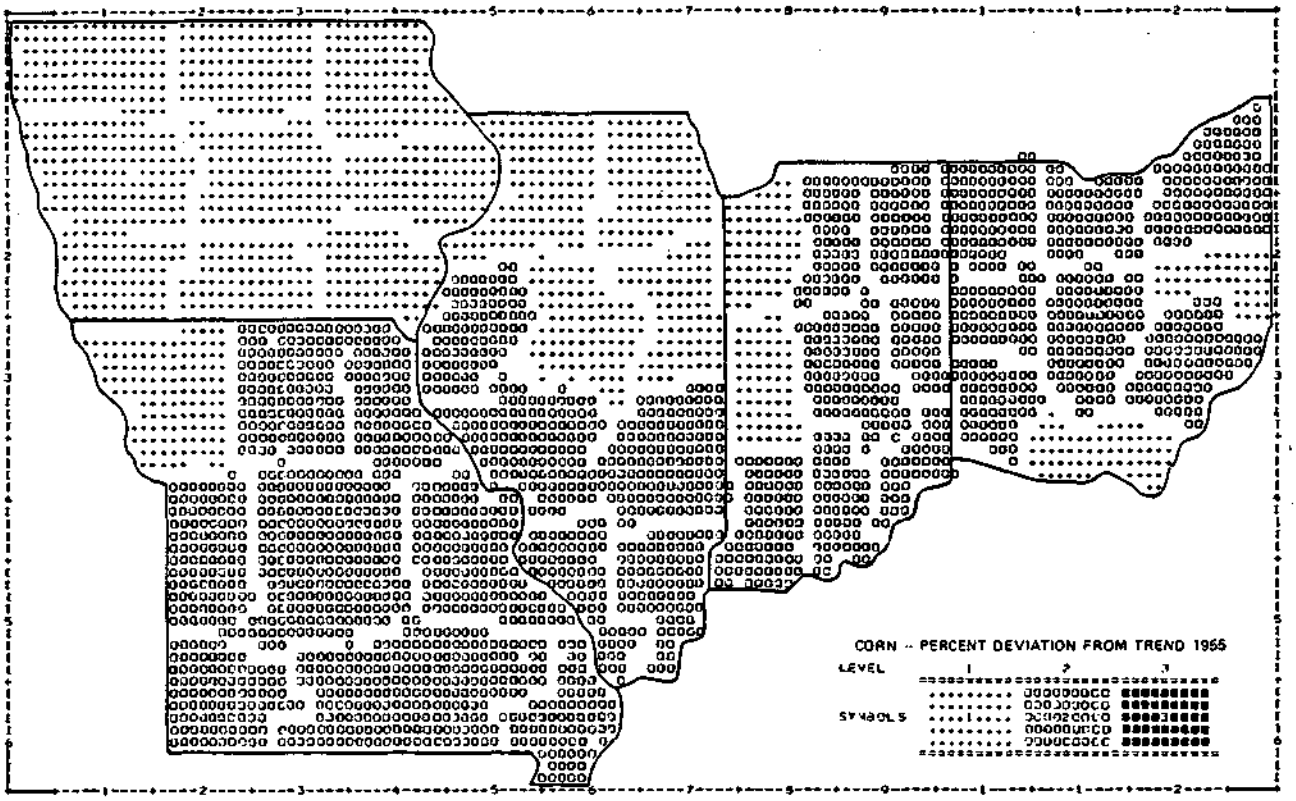

AUGUST -- TEMPERATURE 1956
LEVEL
SYMBOLS

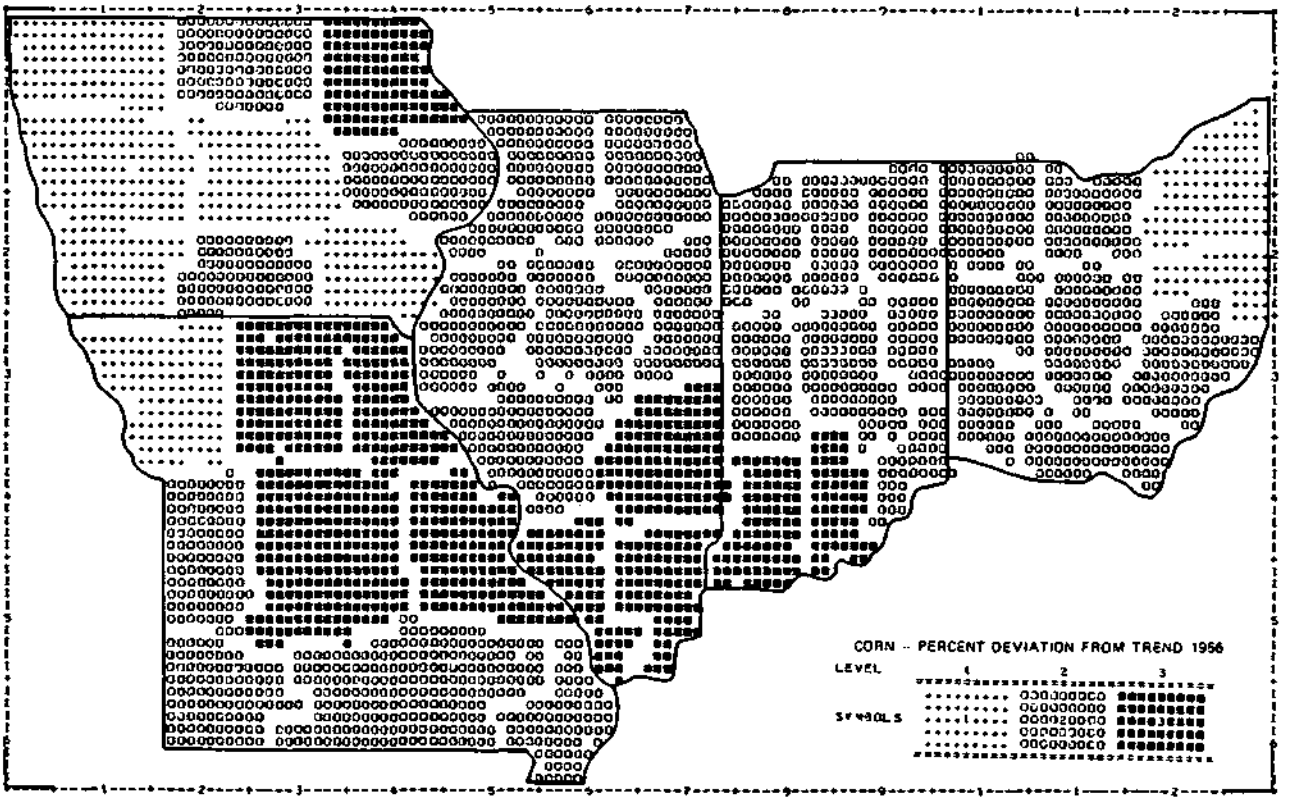

JULY - RAIN 1955
LEVEL
1
2
3
SYMBOLS

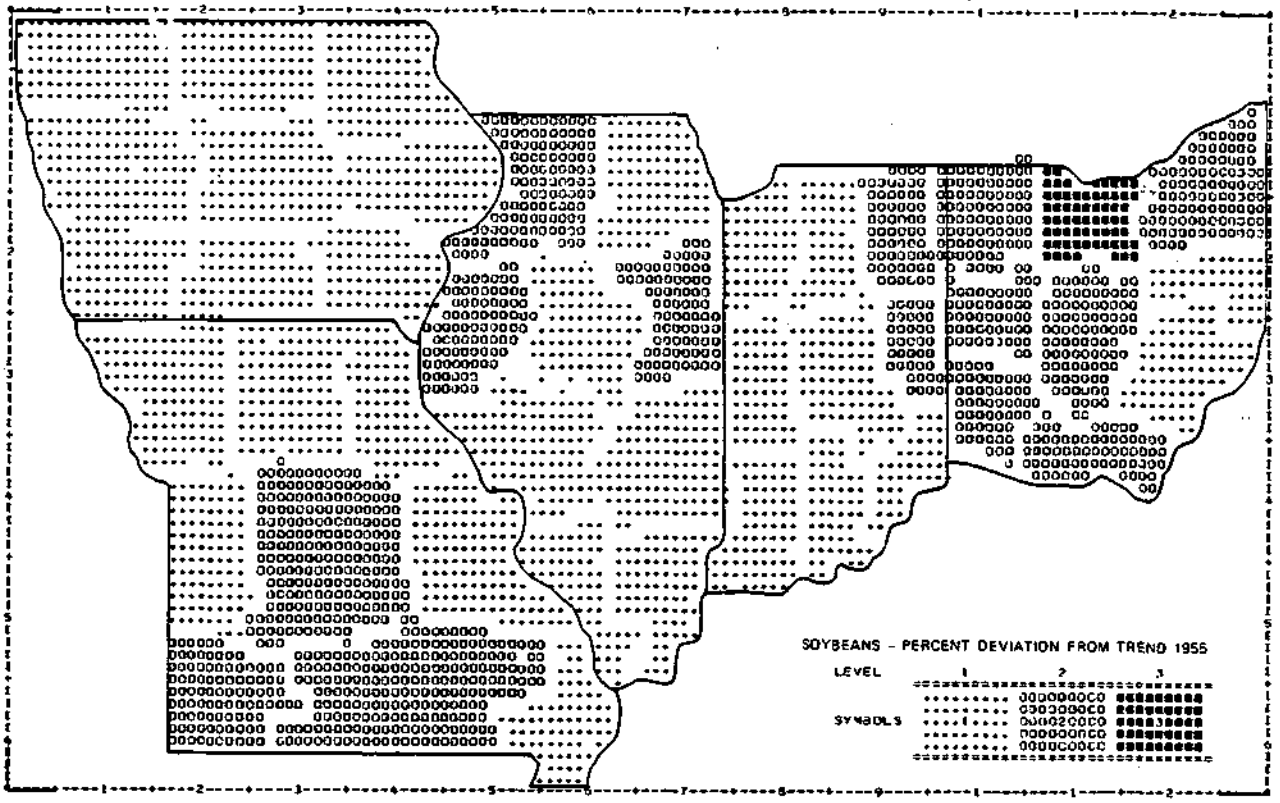

JULY - RAIN 1956
LEVEL
1
2
3
SYMBOLS

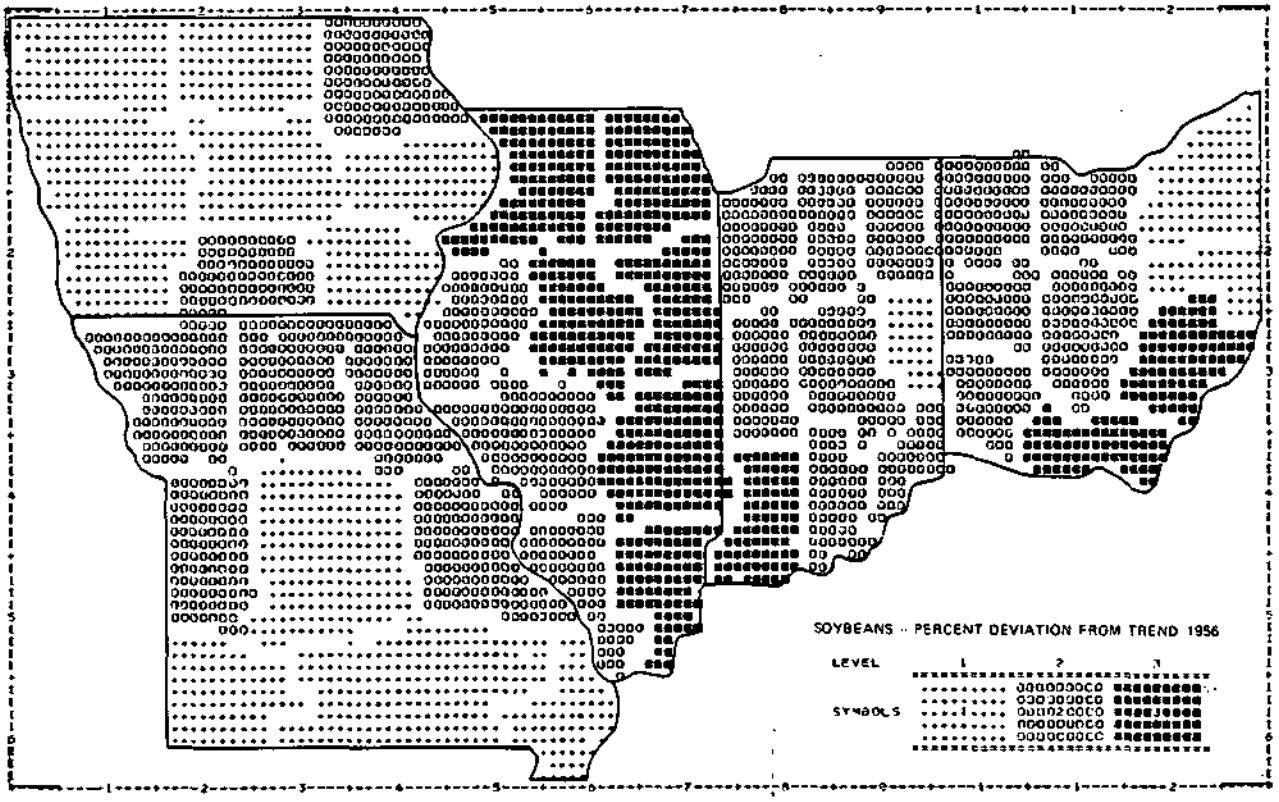

AUGUST -- RAIN 1955
LEVEL
1
2
3
SYMBOLS

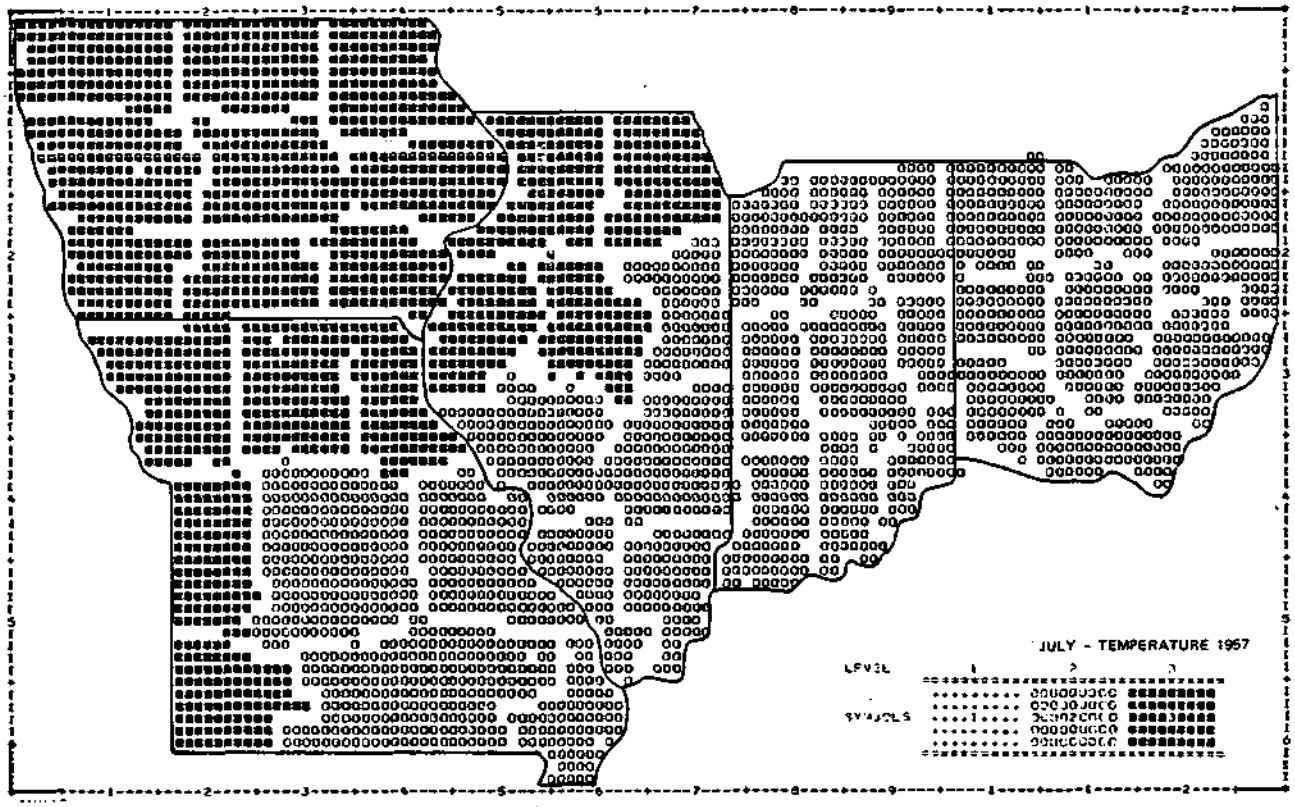

AUGUST -- RAIN 1956
LEVEL
1
2
3
SYMBOLS

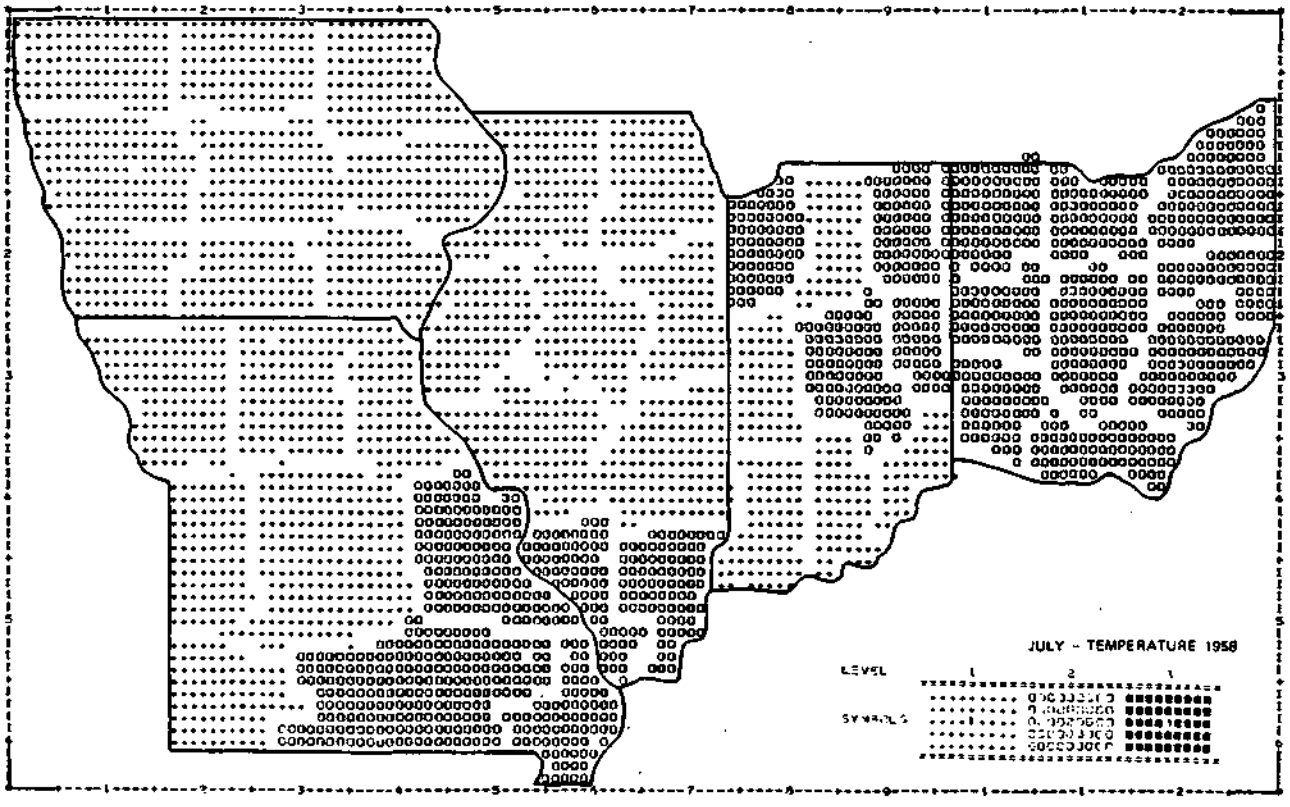

CORN -- PERCENT DEVIATION FROM TREND 1955
LEVEL
1
2
3
SYMBOLS

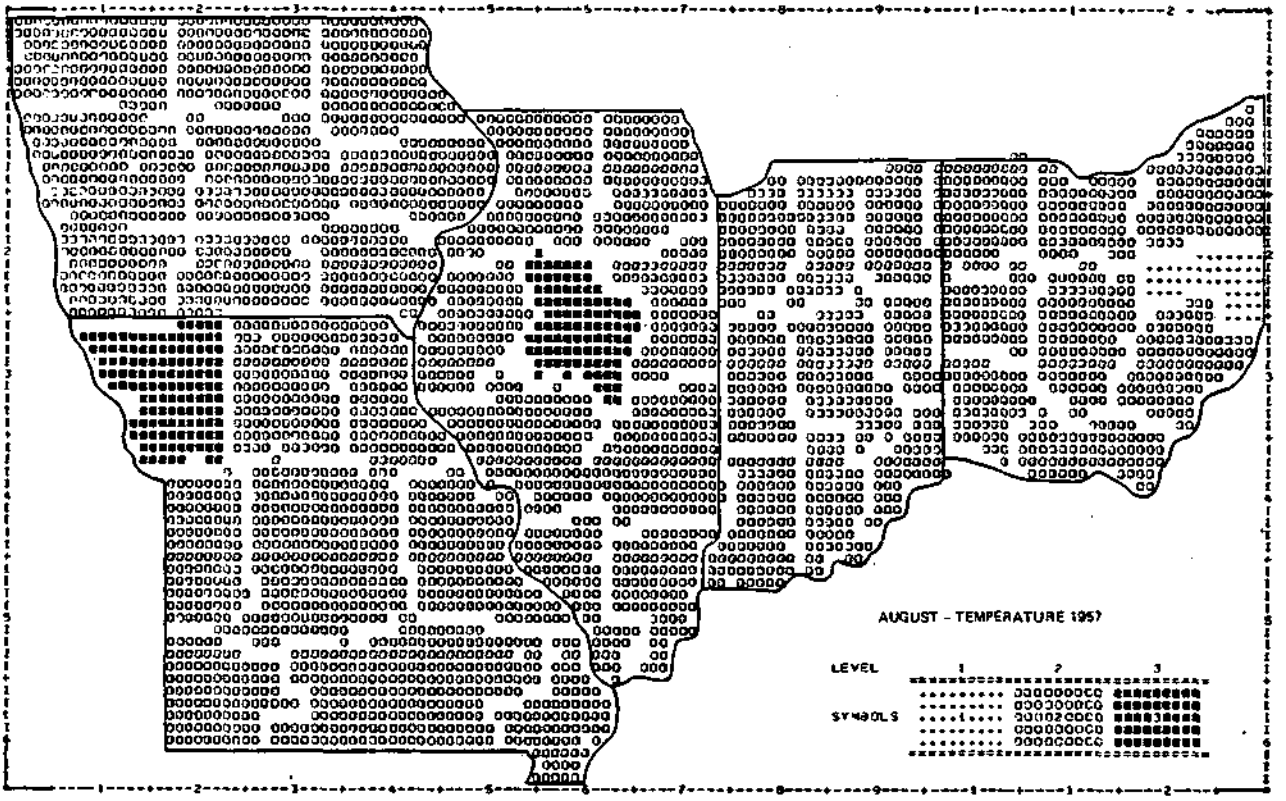

CORN -- PERCENT DEVIATION FROM TREND 1956
LEVEL
1
2
3
SYMBOLS

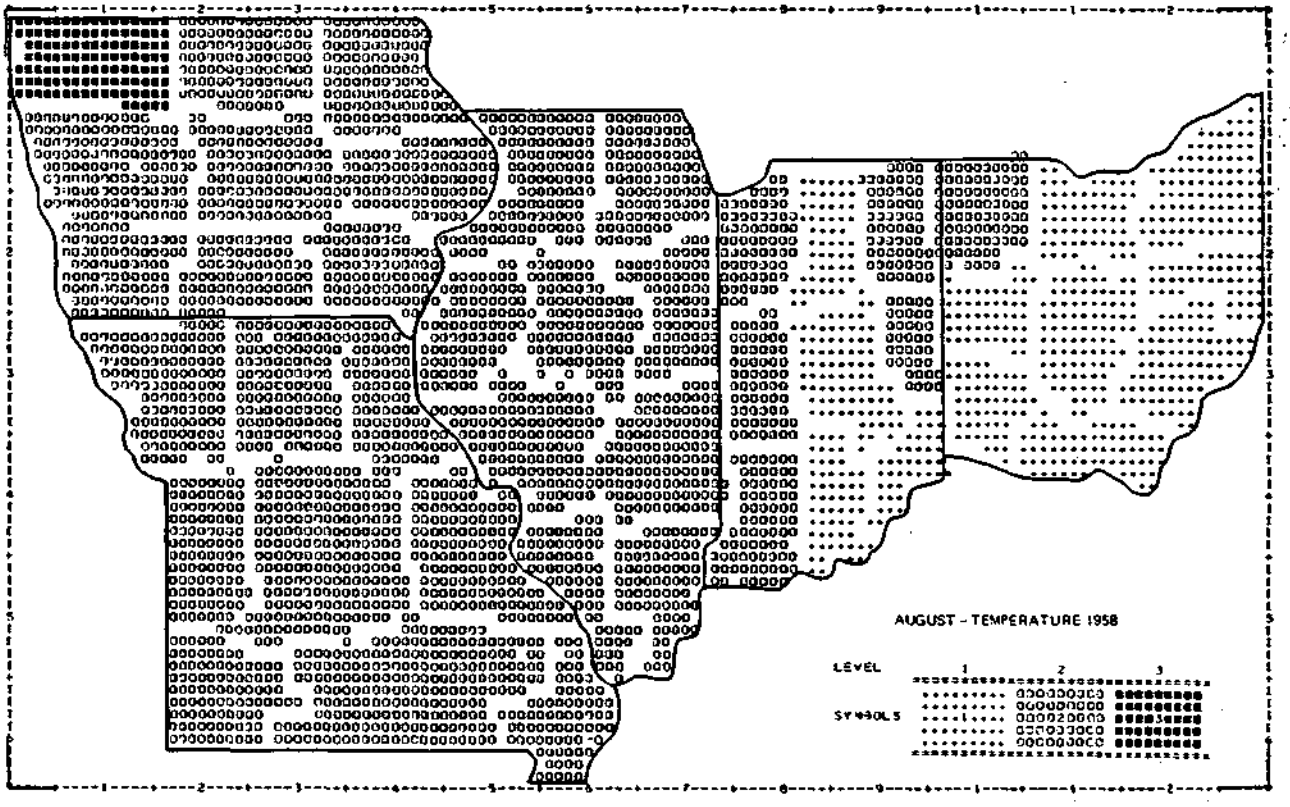

SOYBEANS - PERCENT DEVIATION FROM TREND 1955
LEVEL
1
2
3
SYMBOLS

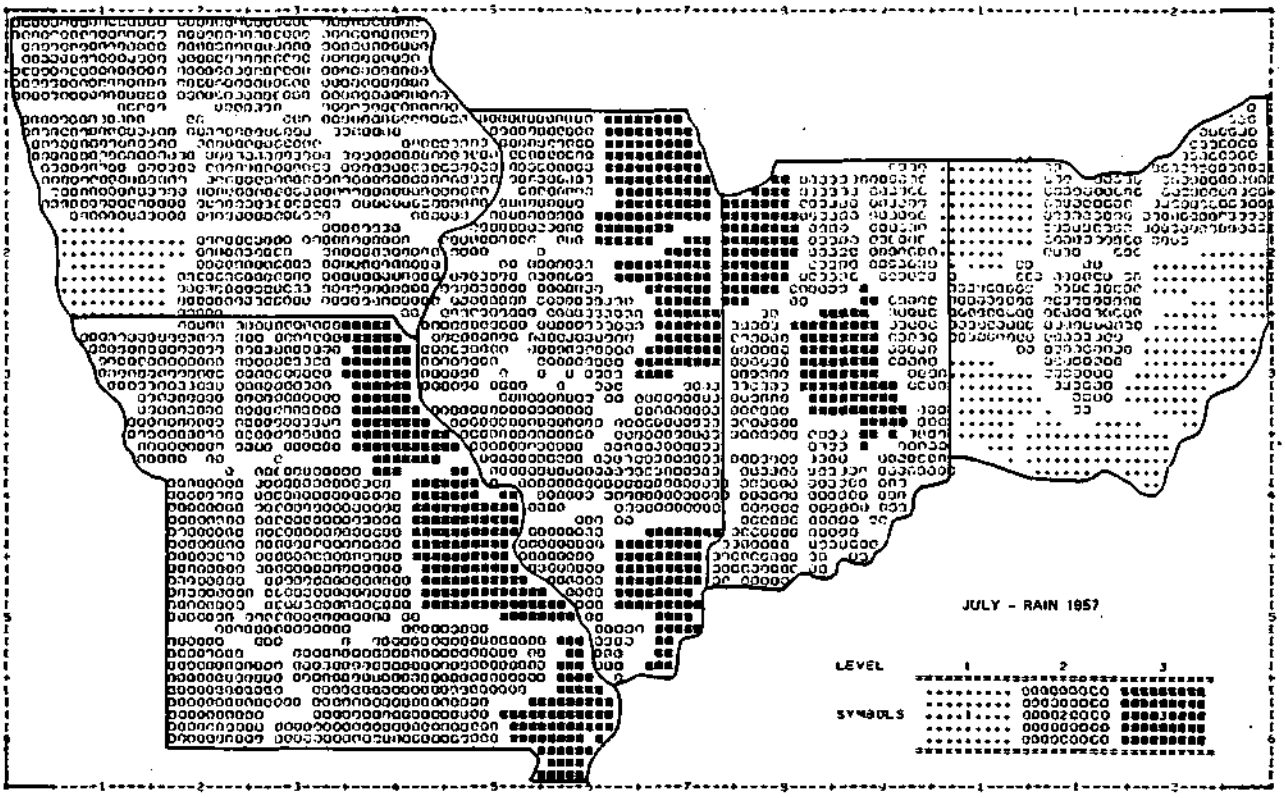

SOYBEANS - PERCENT DEVIATION FROM TREND 1956
LEVEL
1
2
3
SYMBOLS

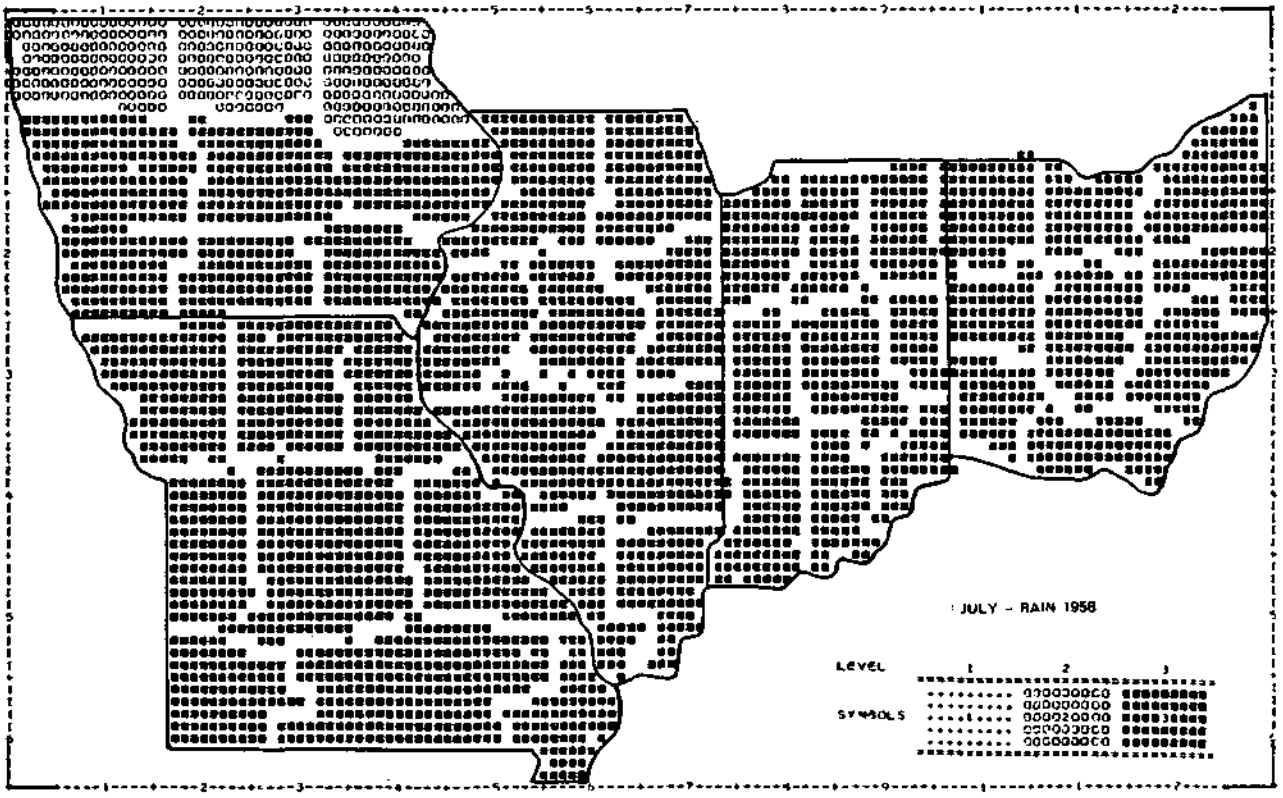

JULY - TEMPERATURE 1957
LEVEL
SYMBOLS

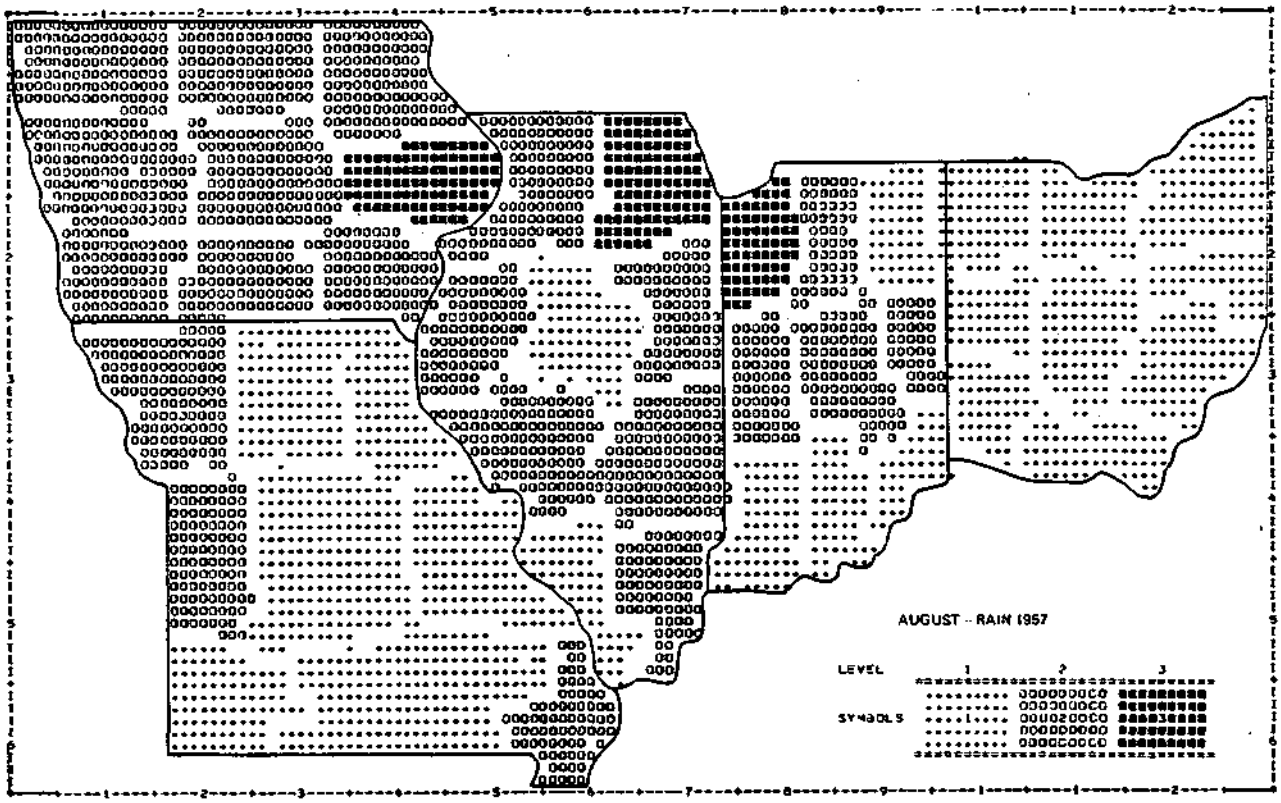

JULY - TEMPERATURE 1958
LEVEL
SYMBOLS

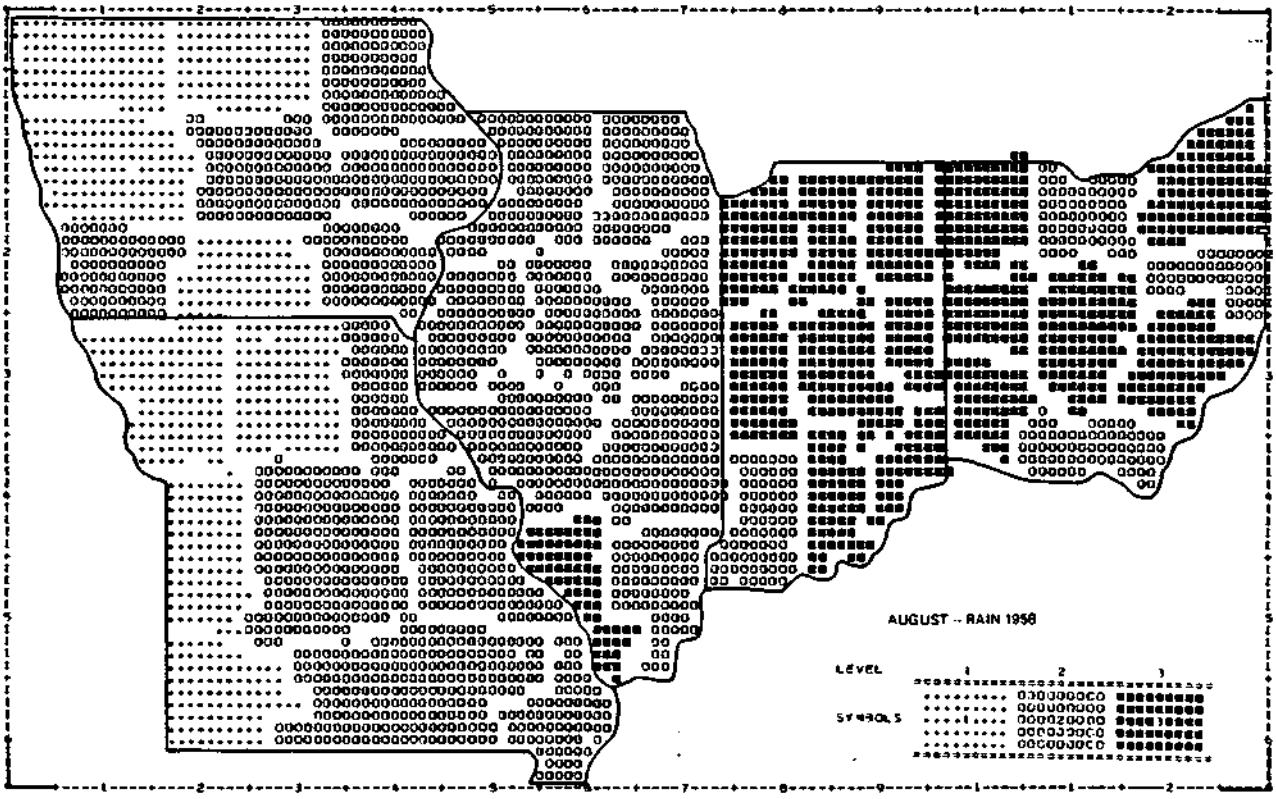

AUGUST - TEMPERATURE 1957
LEVEL
1
2
3
SYMBOLS

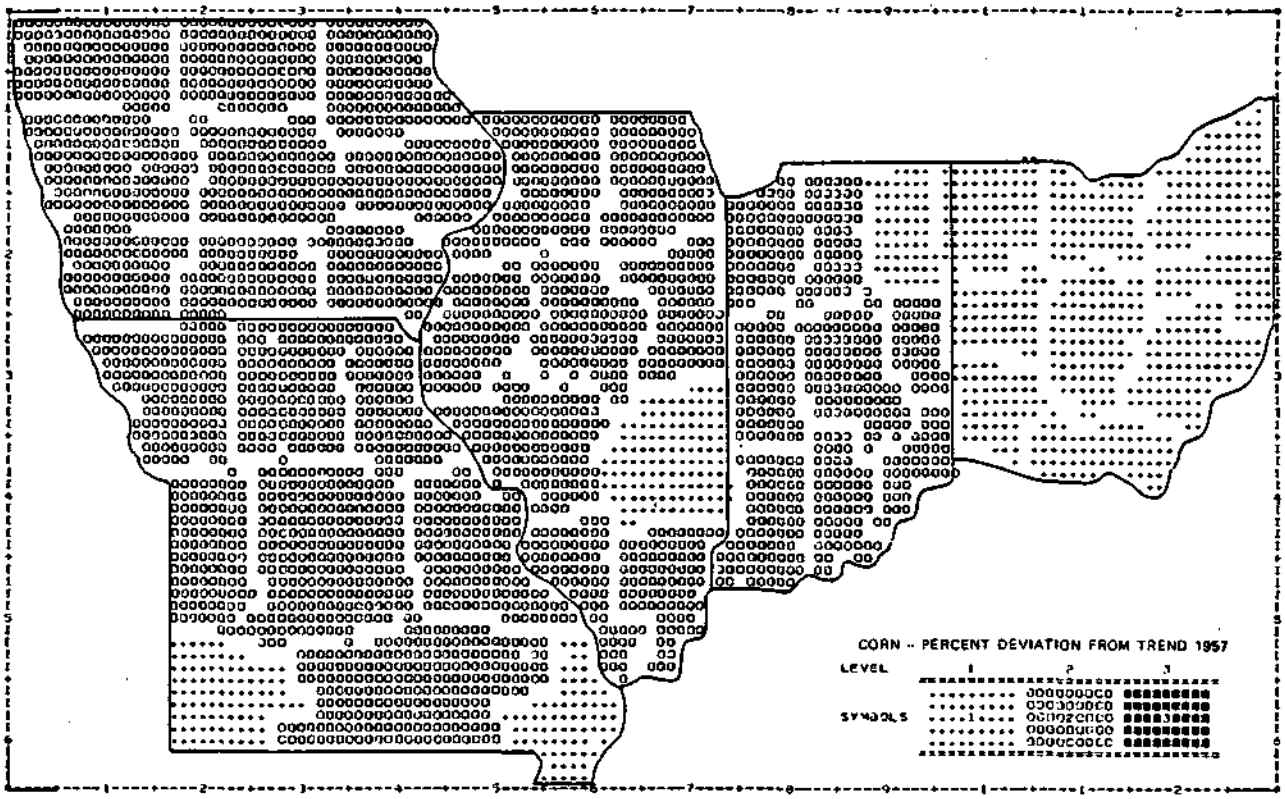

AUGUST - TEMPERATURE 1958
LEVEL
1
2
3
SYMBOLS

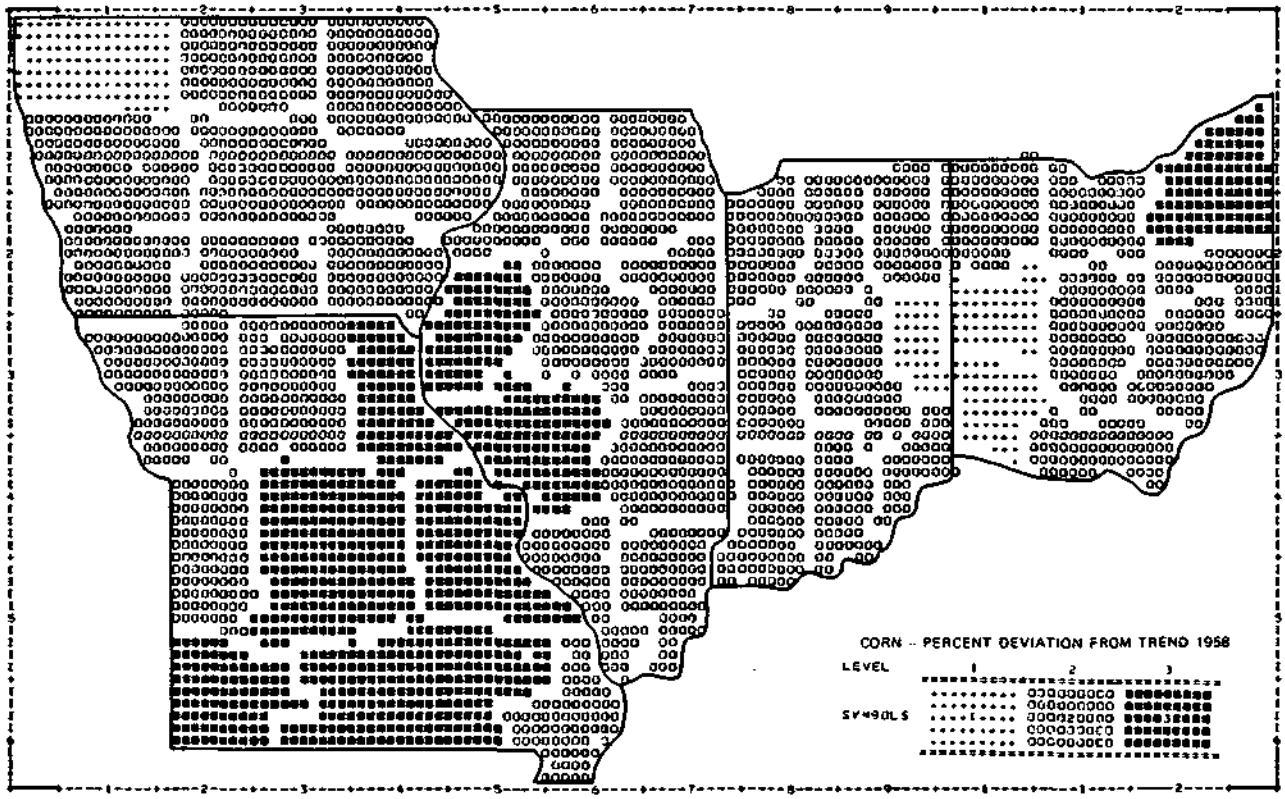

JULY - RAIN 1957
LEVEL
1
2
3
SYMBOLS

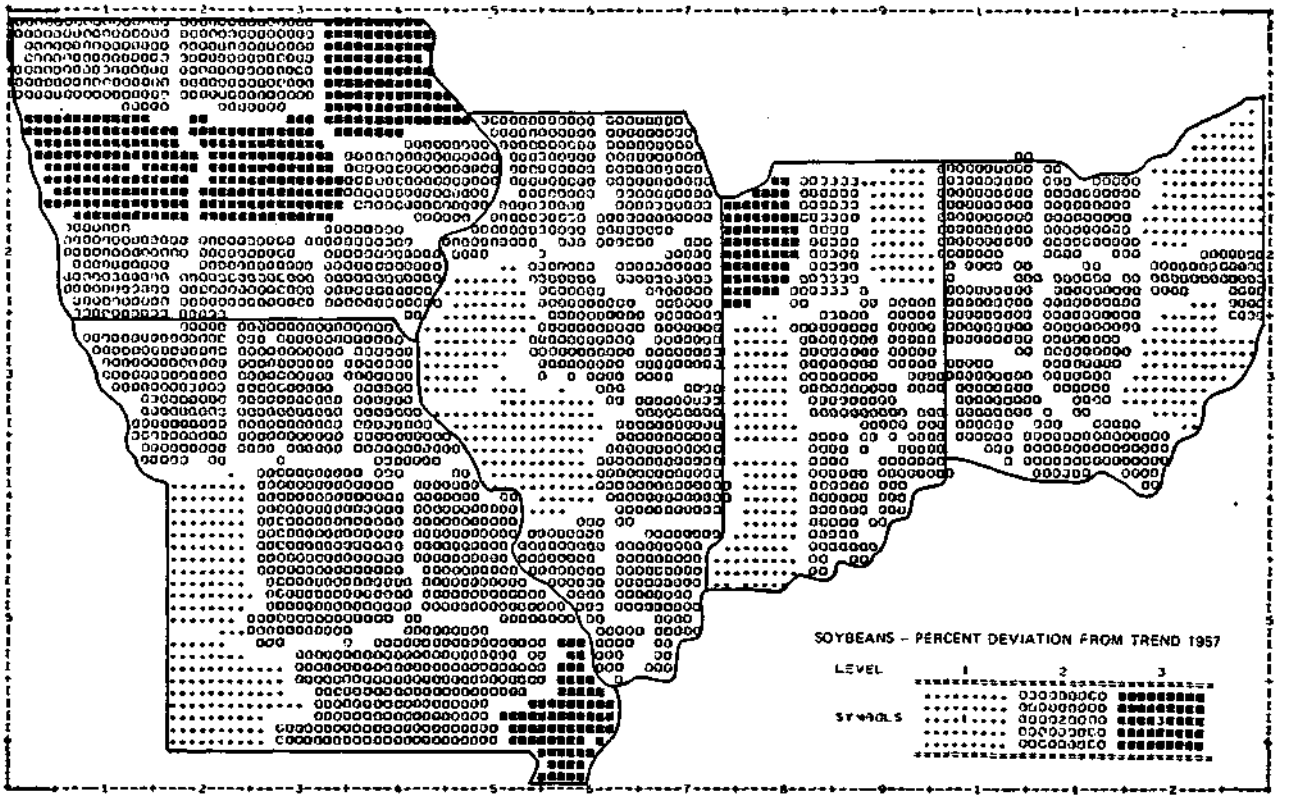

JULY - RAIN 1958
LEVEL
1
2
3
SYMBOLS

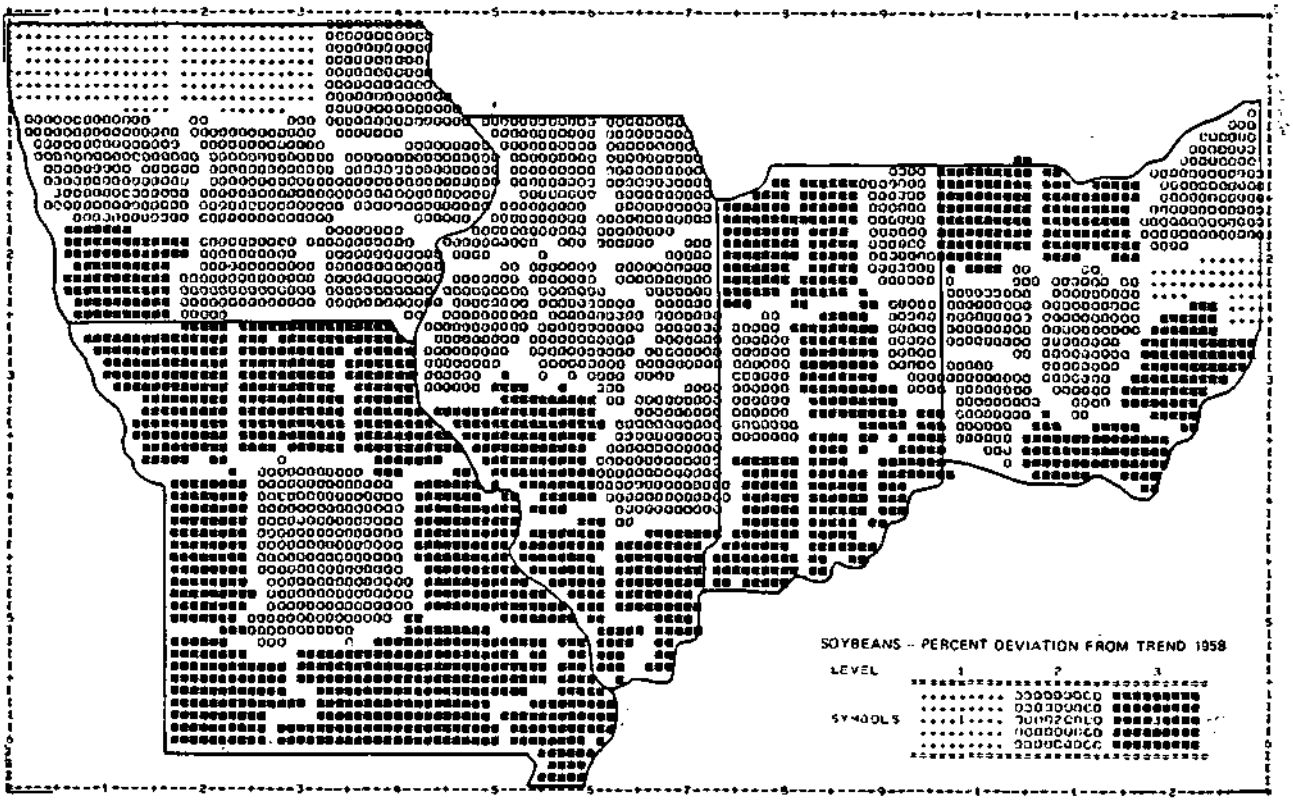

AUGUST -- RAIN 1957
LEVEL
1
2
3
SYMBOLS

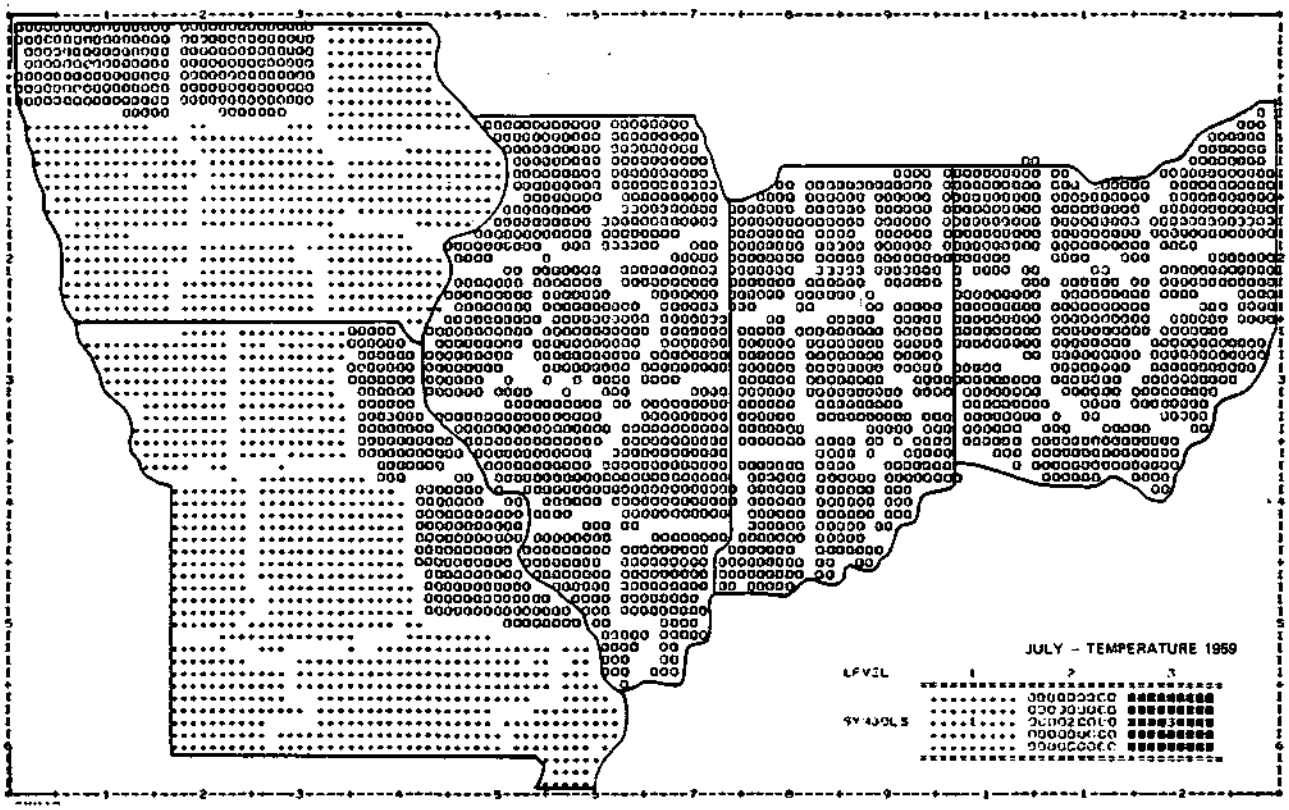

AUGUST -- RAIN 1958
LEVEL
1
2
3
SYMBOLS

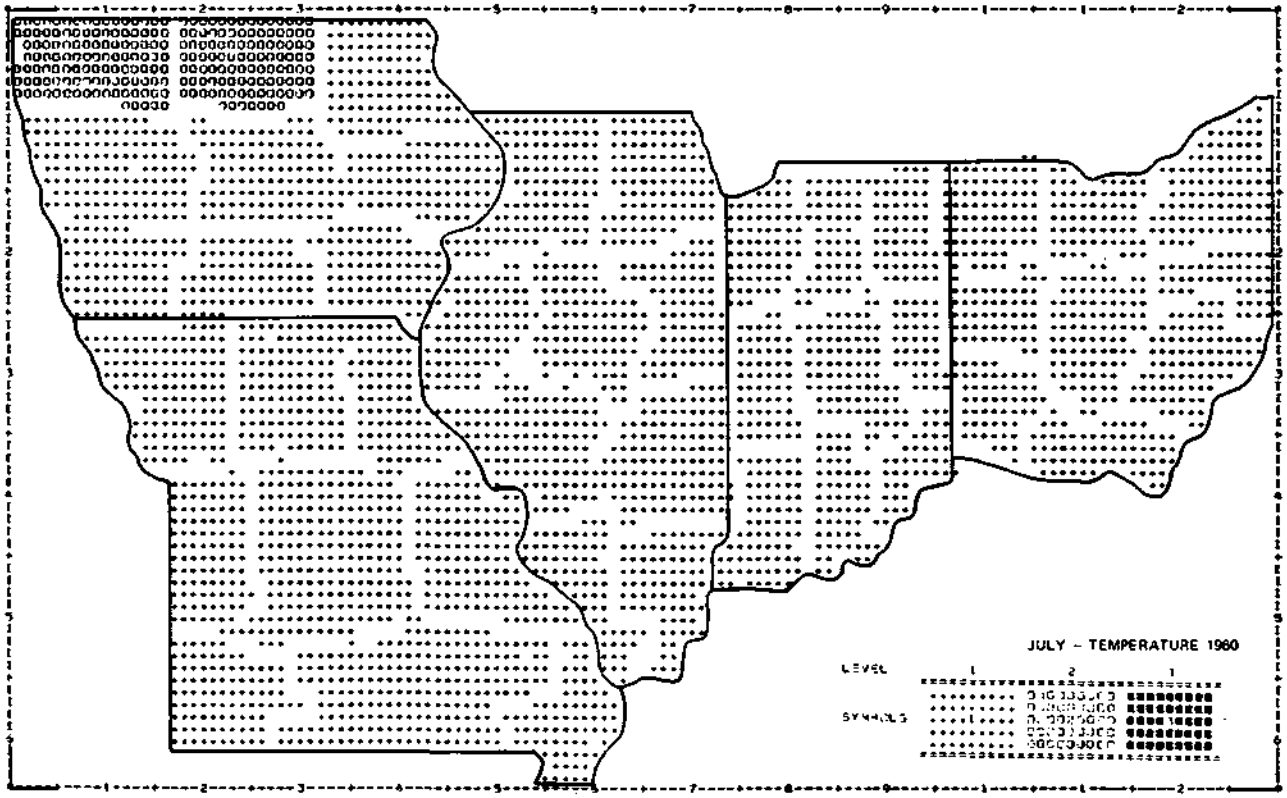

CORN -- PERCENT DEVIATION FROM TREND 1957
LEVEL
1
2
3

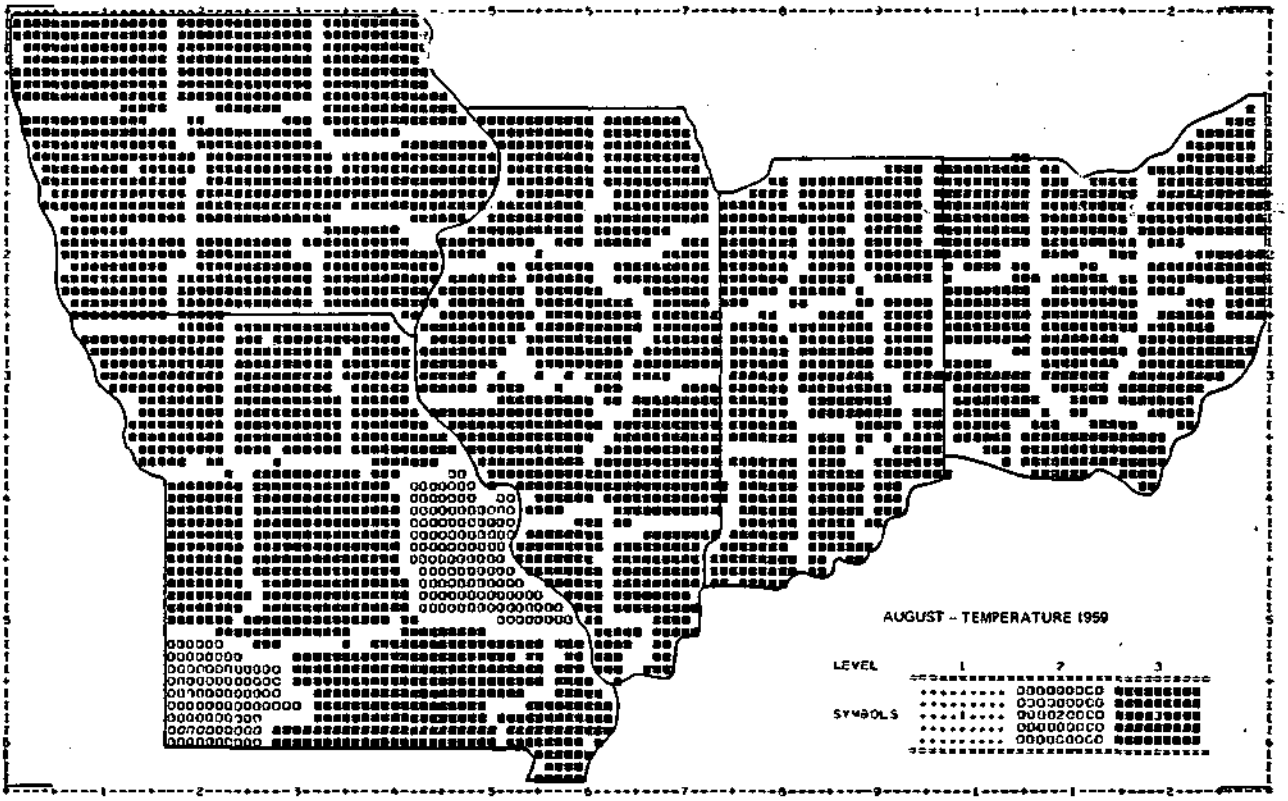

CORN -- PERCENT DEVIATION FROM TREND 1958
LEVEL
1
2
3

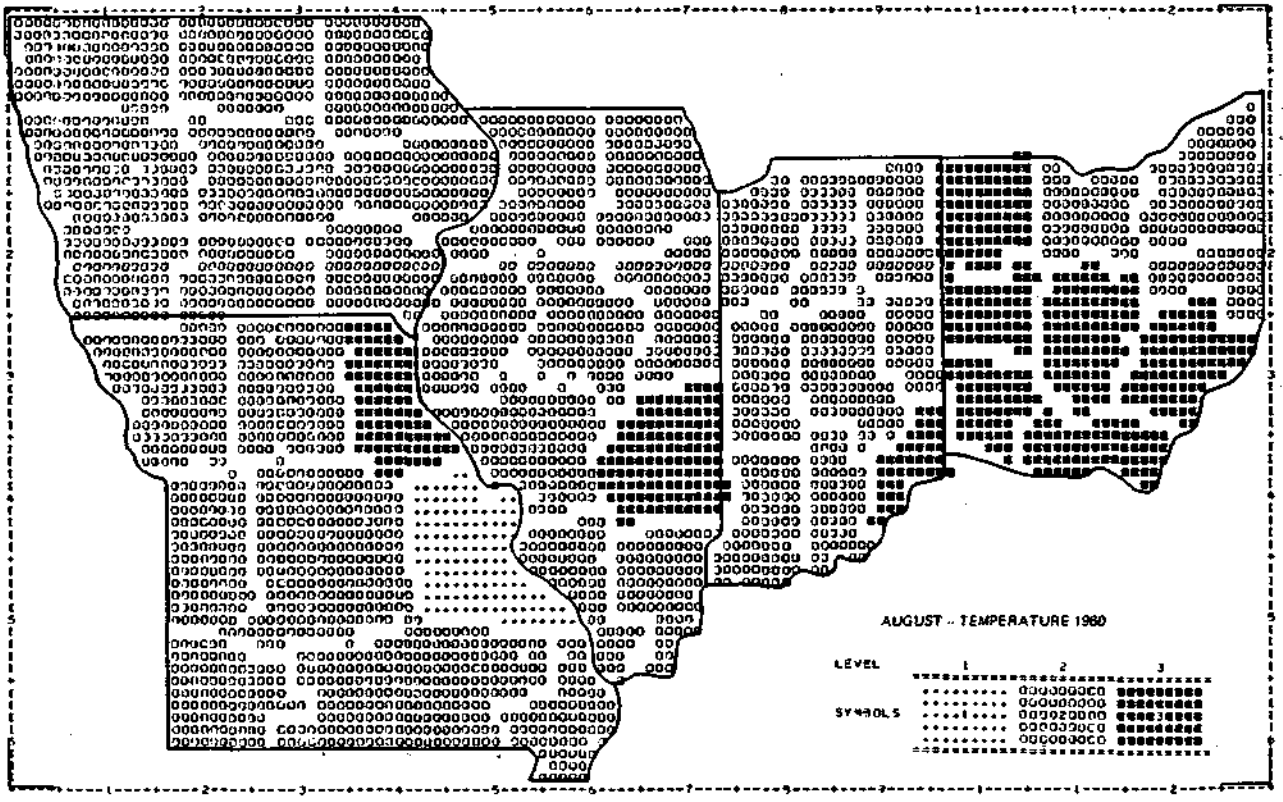

SOYBEANS – PERCENT DEVIATION FROM TREND 1957
LEVEL
1
2
3
SYMBOLS

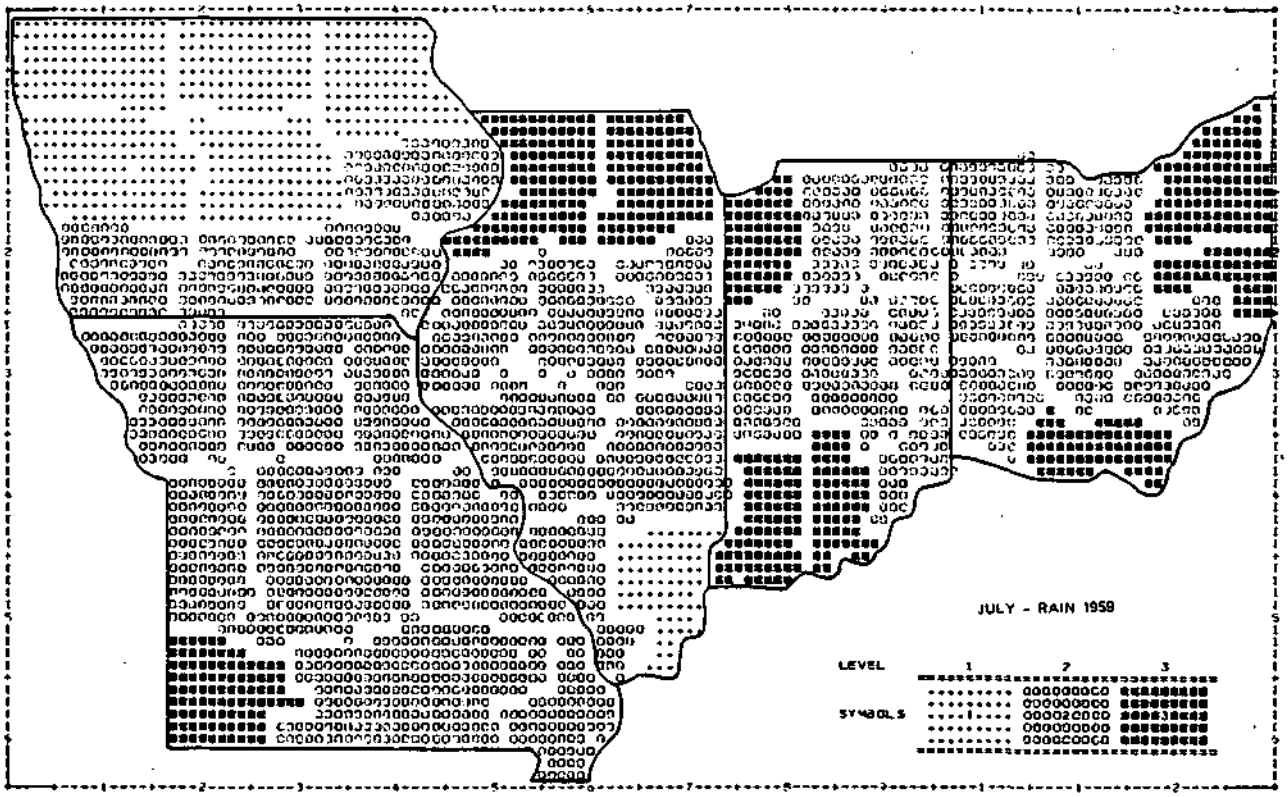

SOYBEANS – PERCENT DEVIATION FROM TREND 1958
LEVEL
1
2
3
SYMBOLS

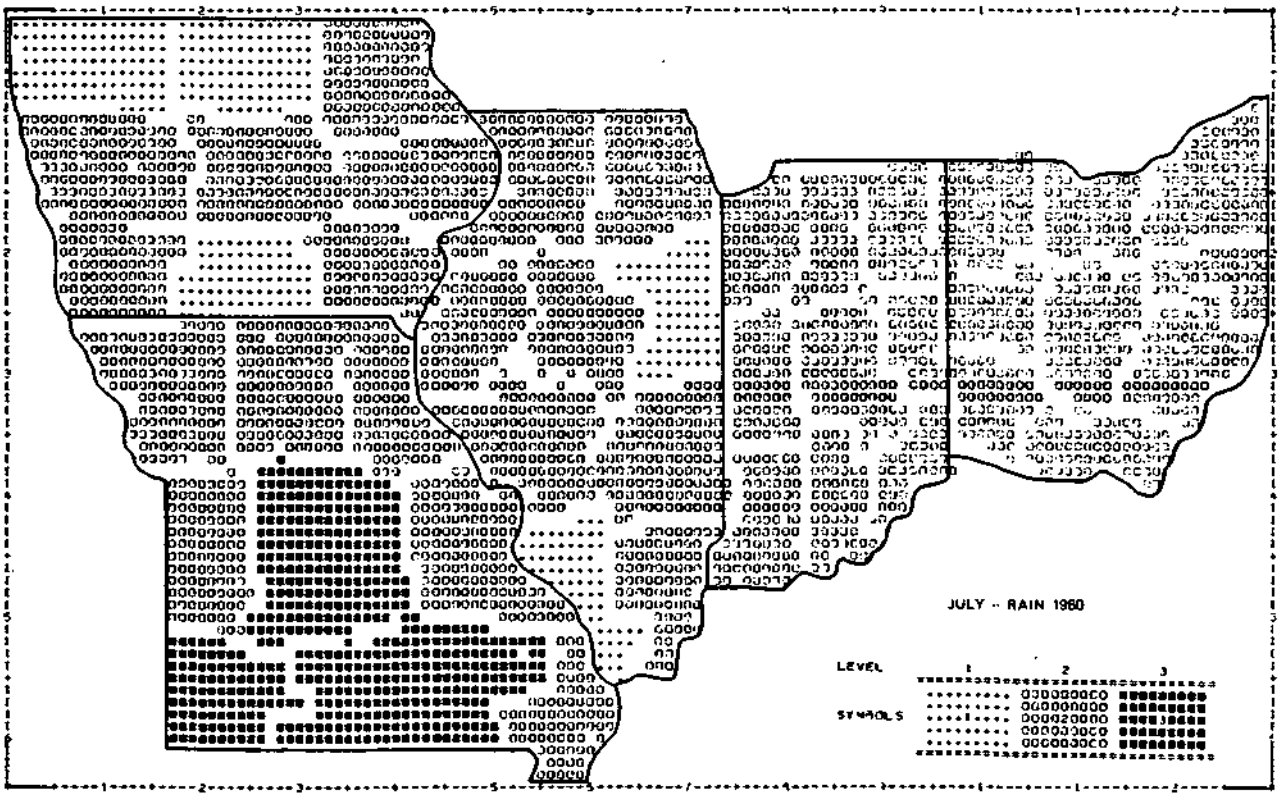

JULY – TEMPERATURE 1959
LEVEL
1
2
3
SYMBOLS

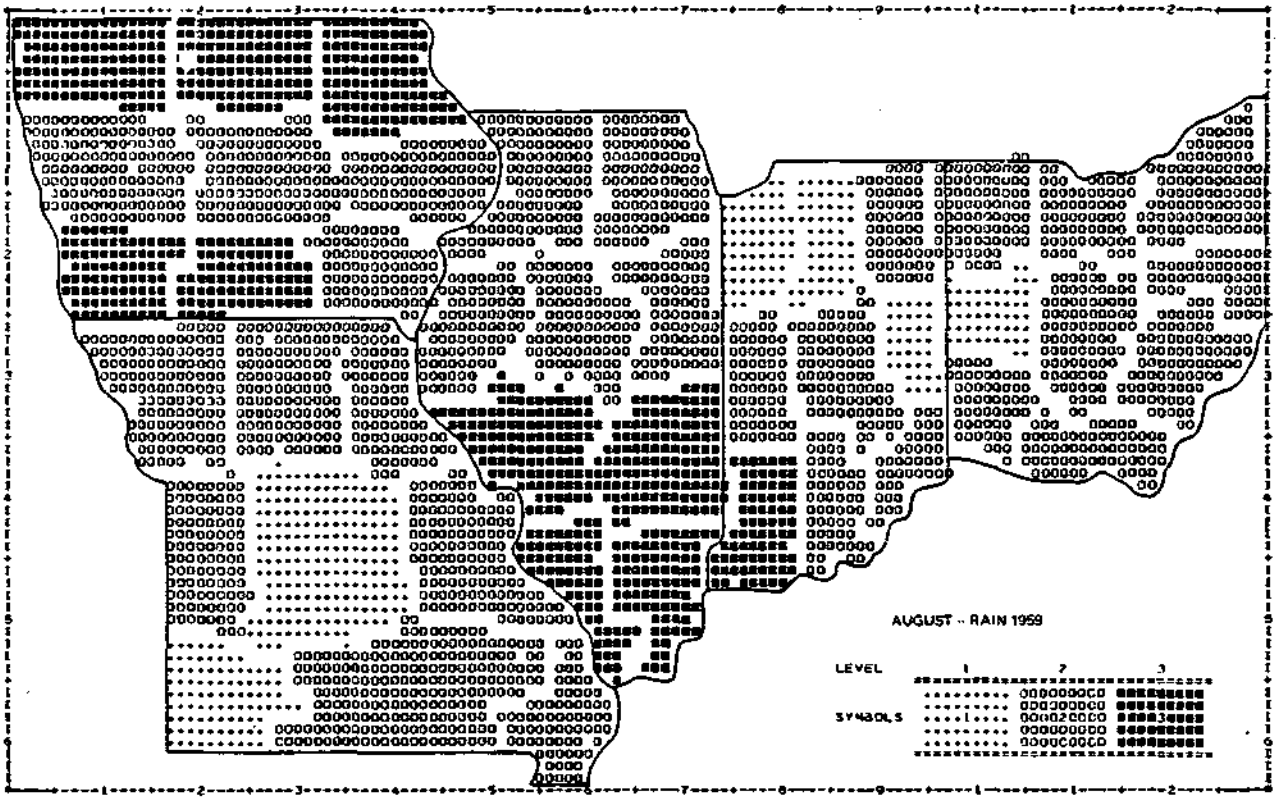

JULY – TEMPERATURE 1960
LEVEL
1
2
3
SYMBOLS

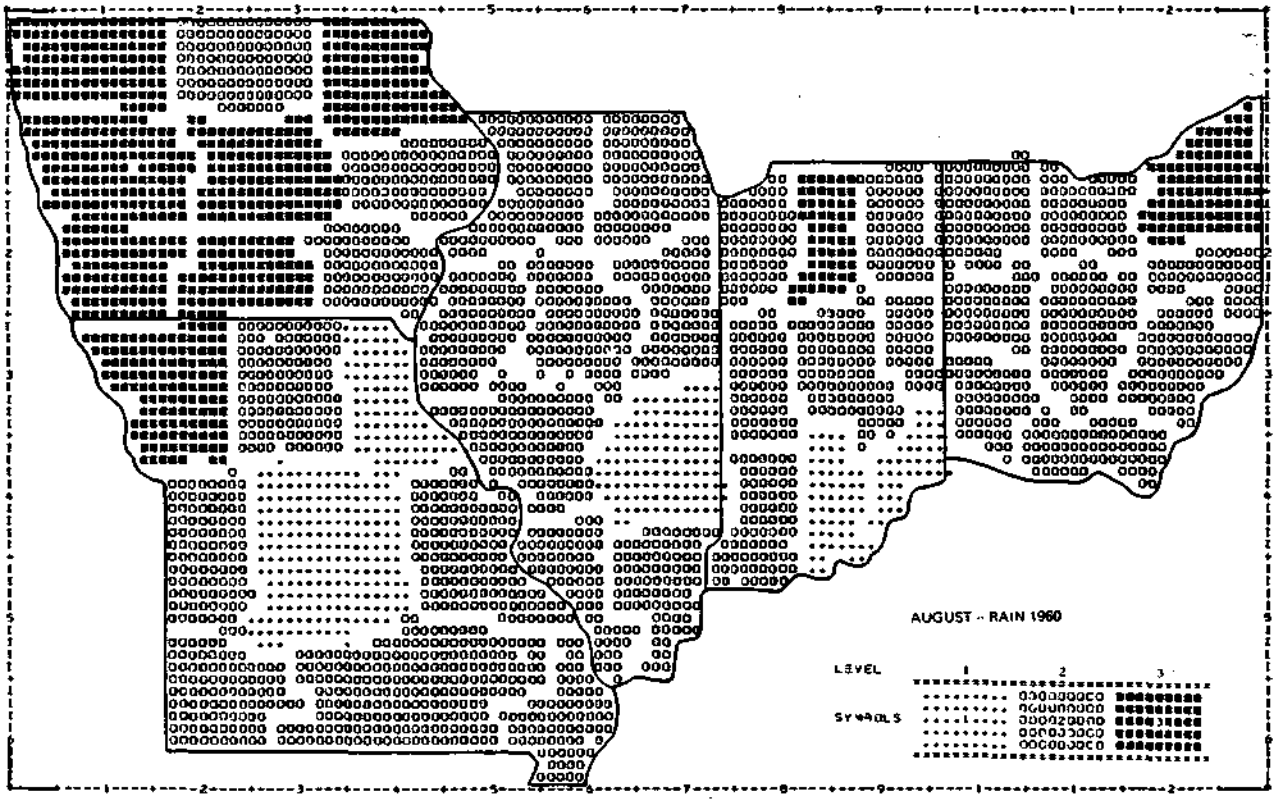

AUGUST – TEMPERATURE 1959
LEVEL
1
2
3
SYMBOLS

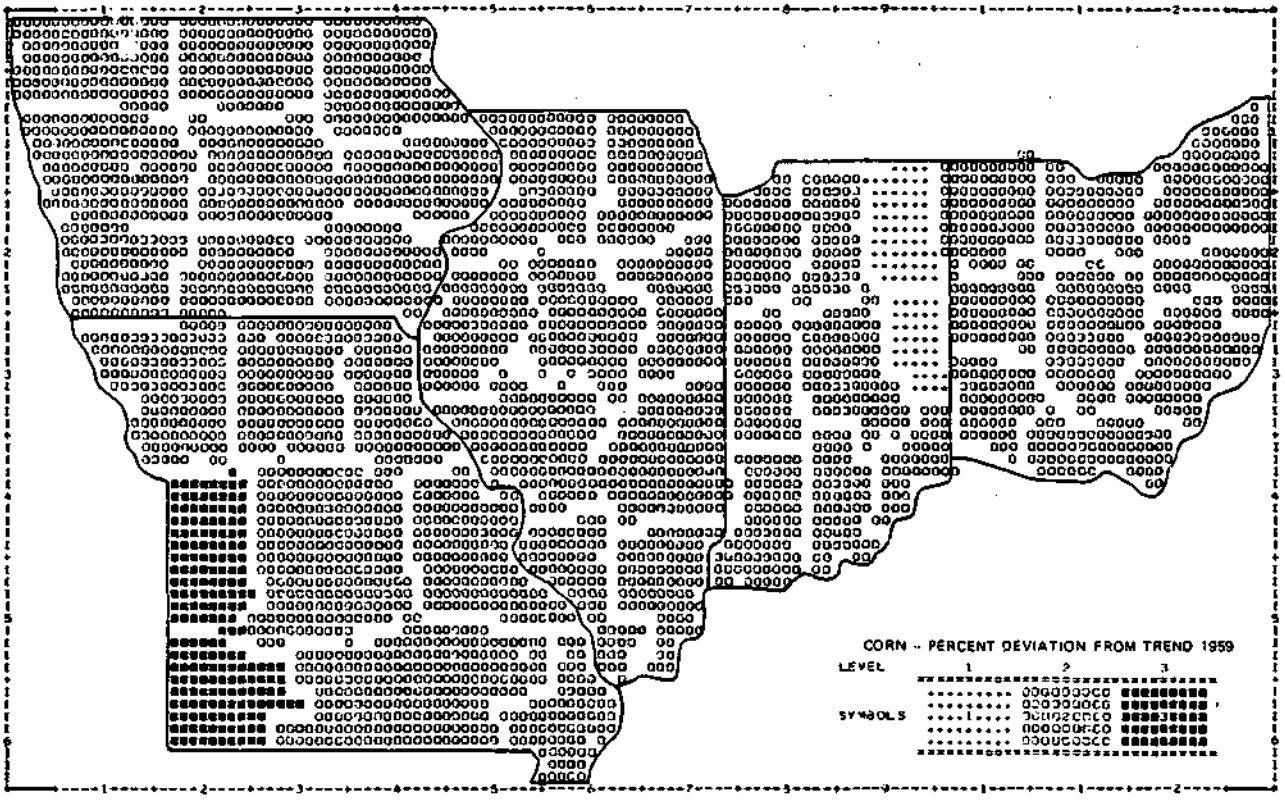

AUGUST – TEMPERATURE 1960
LEVEL
1
2
3
SYMBOLS

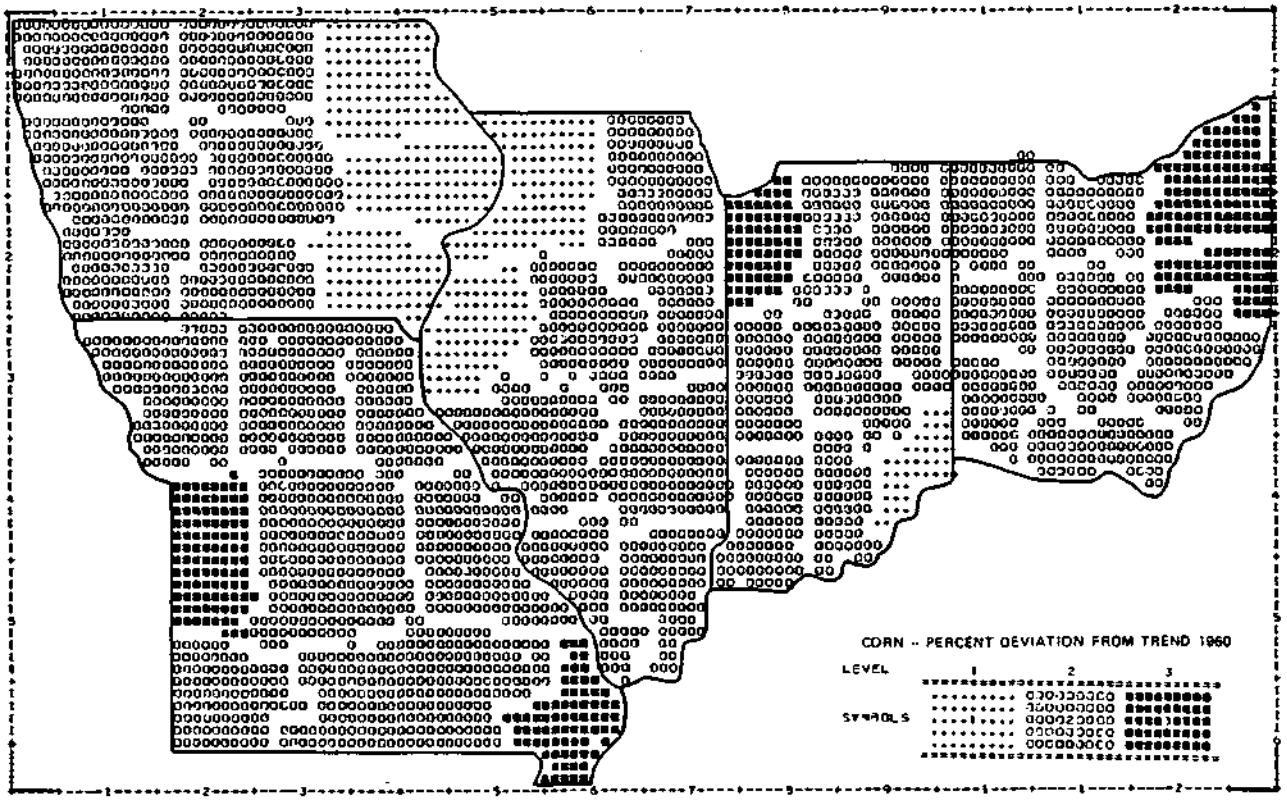

JULY - RAIN 1959
LEVEL
1
2
3
SYMBOLS

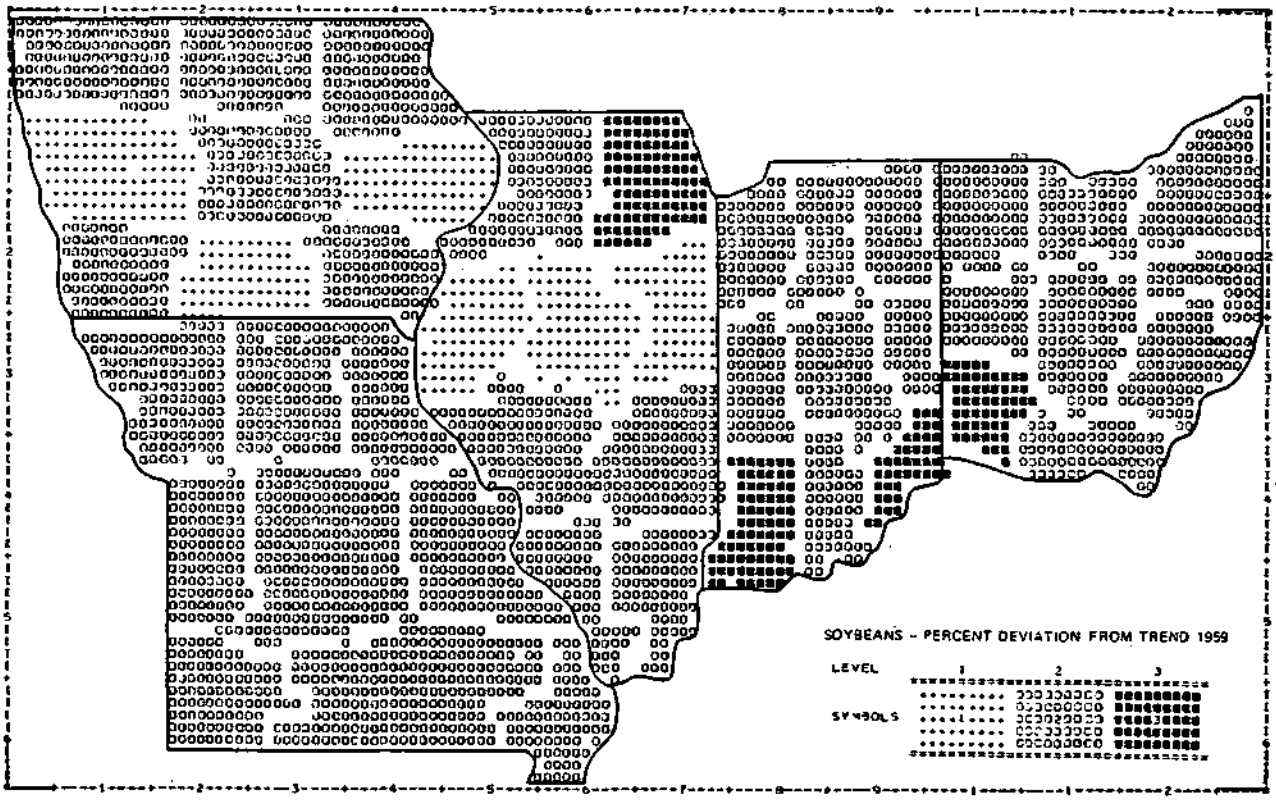

JULY - RAIN 1960
LEVEL
1
2
3
SYMBOLS

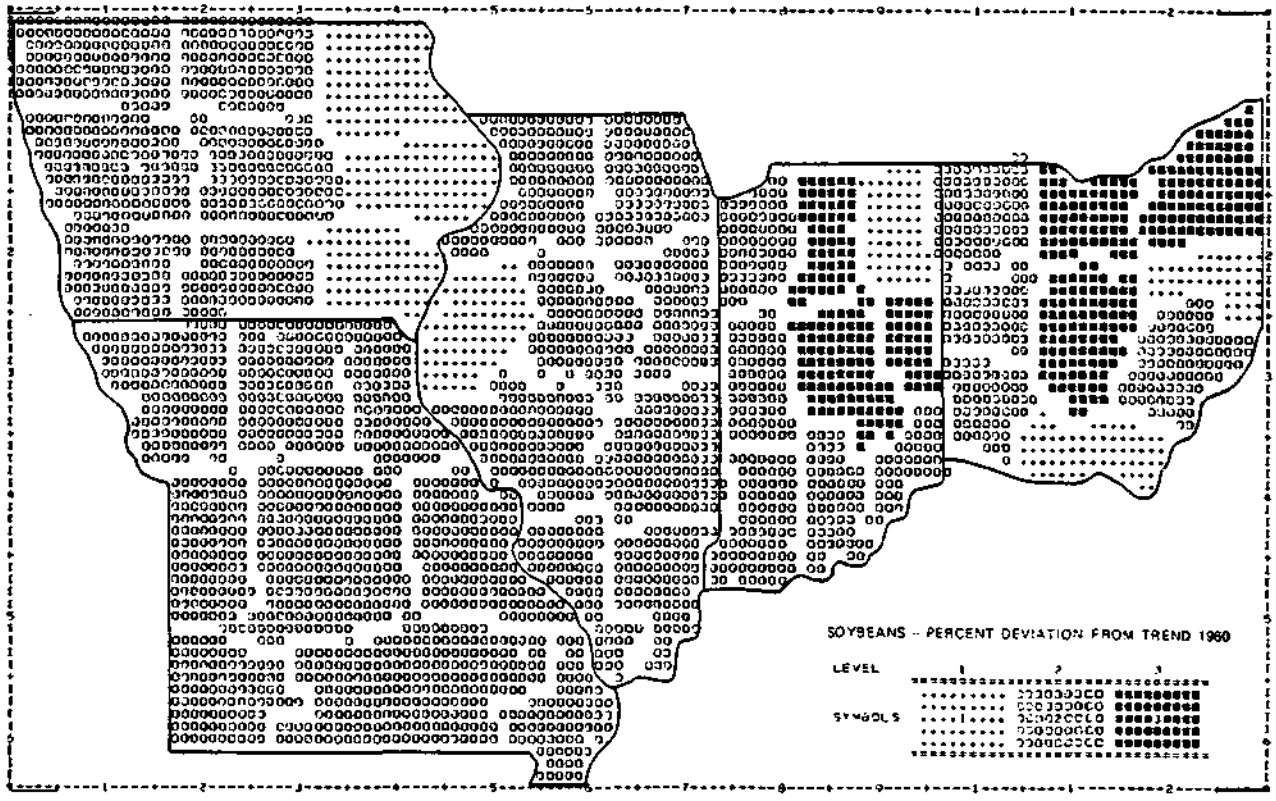

AUGUST - RAIN 1959
LEVEL
1
2
3
SYMBOLS

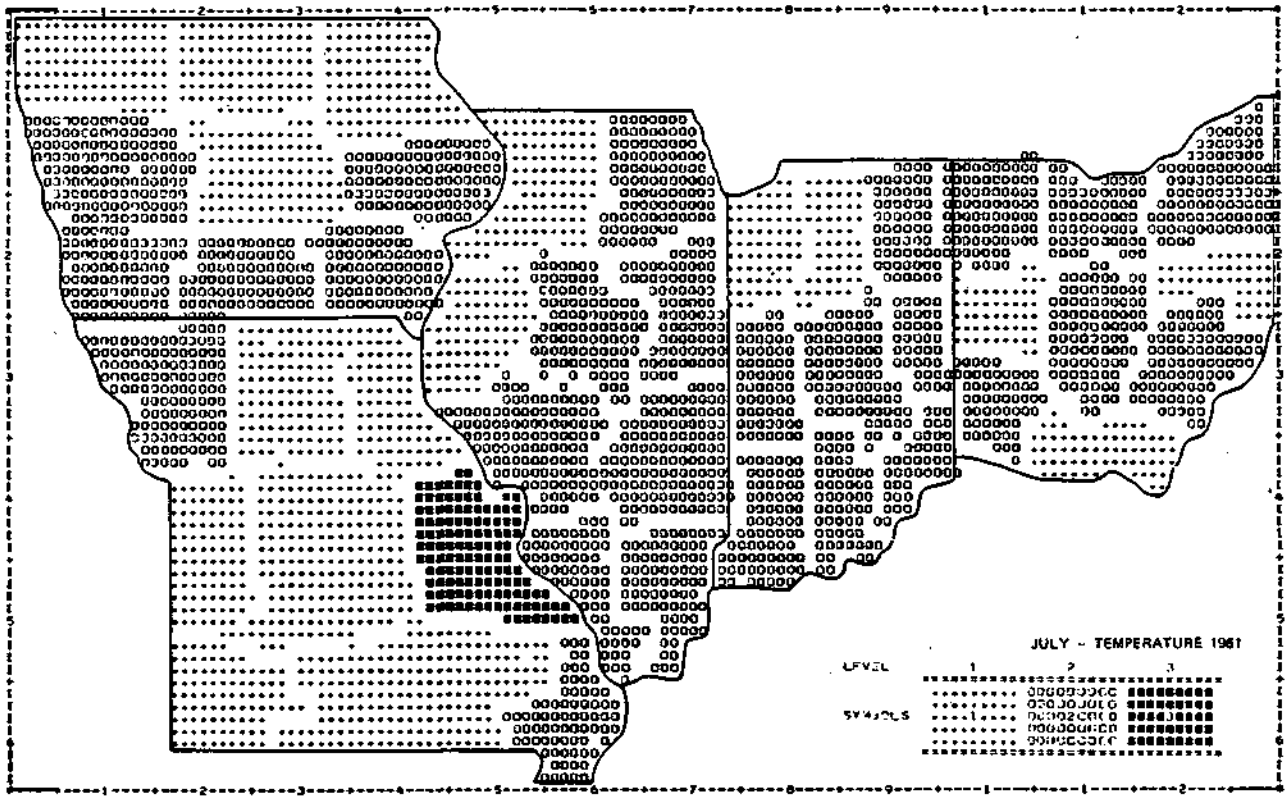

AUGUST - RAIN 1960
LEVEL
1
2
3
SYMBOLS

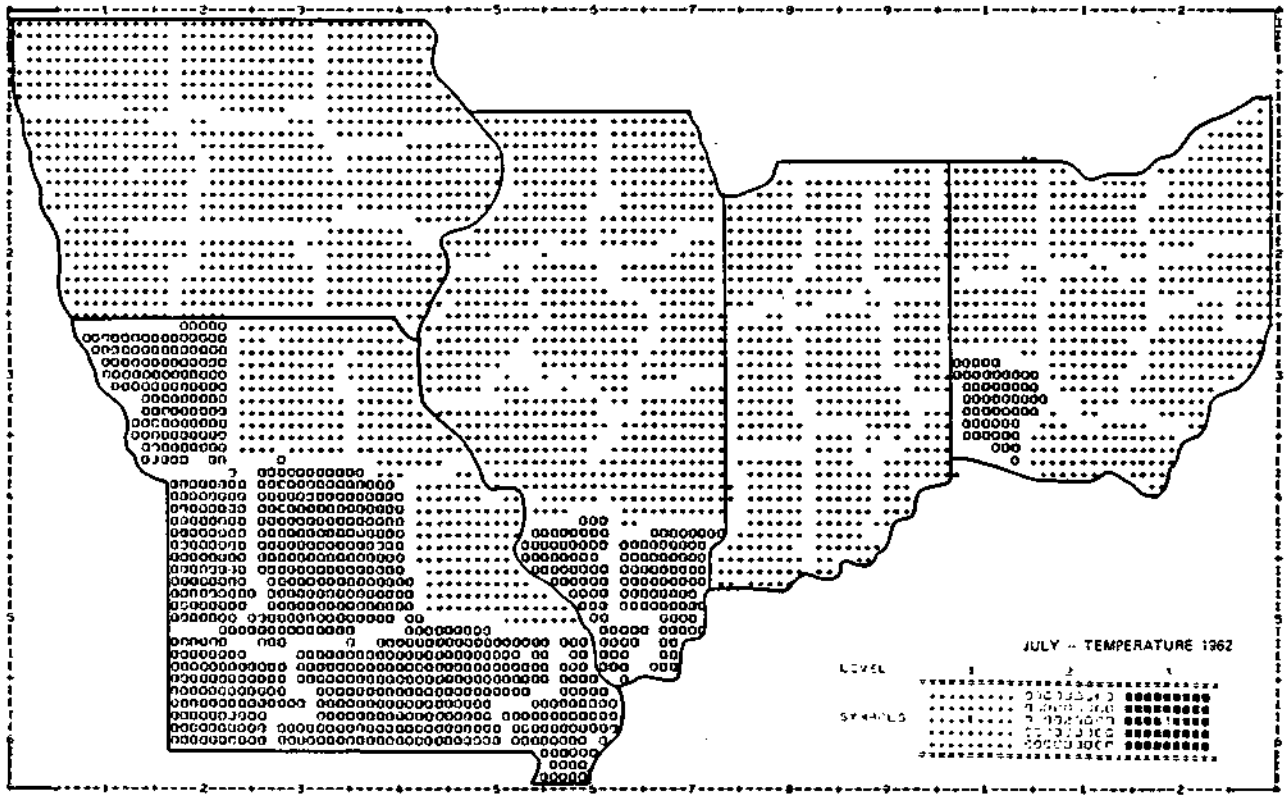

CORN -- PERCENT DEVIATION FROM TREND 1959
LEVEL
1
2
3
SYMBOLS

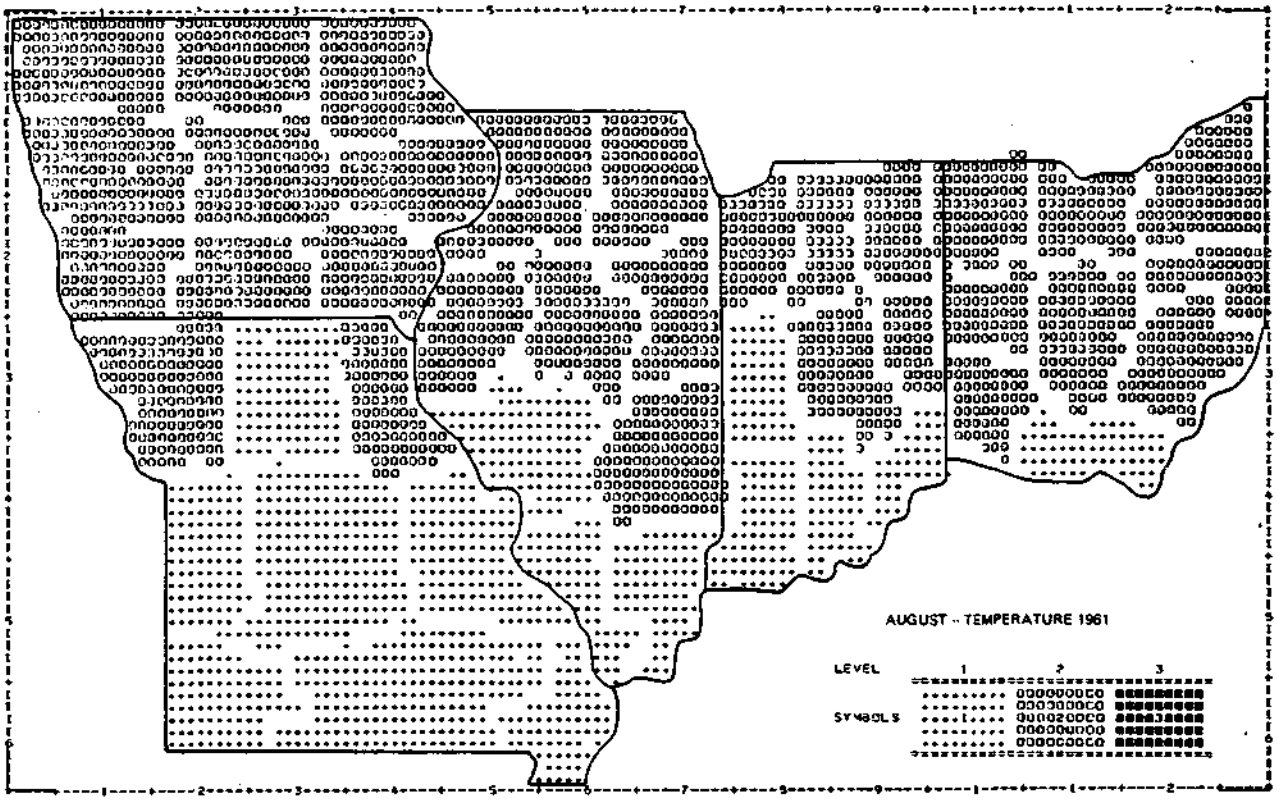

CORN -- PERCENT DEVIATION FROM TREND 1960
LEVEL
1
2
3
SYMBOLS

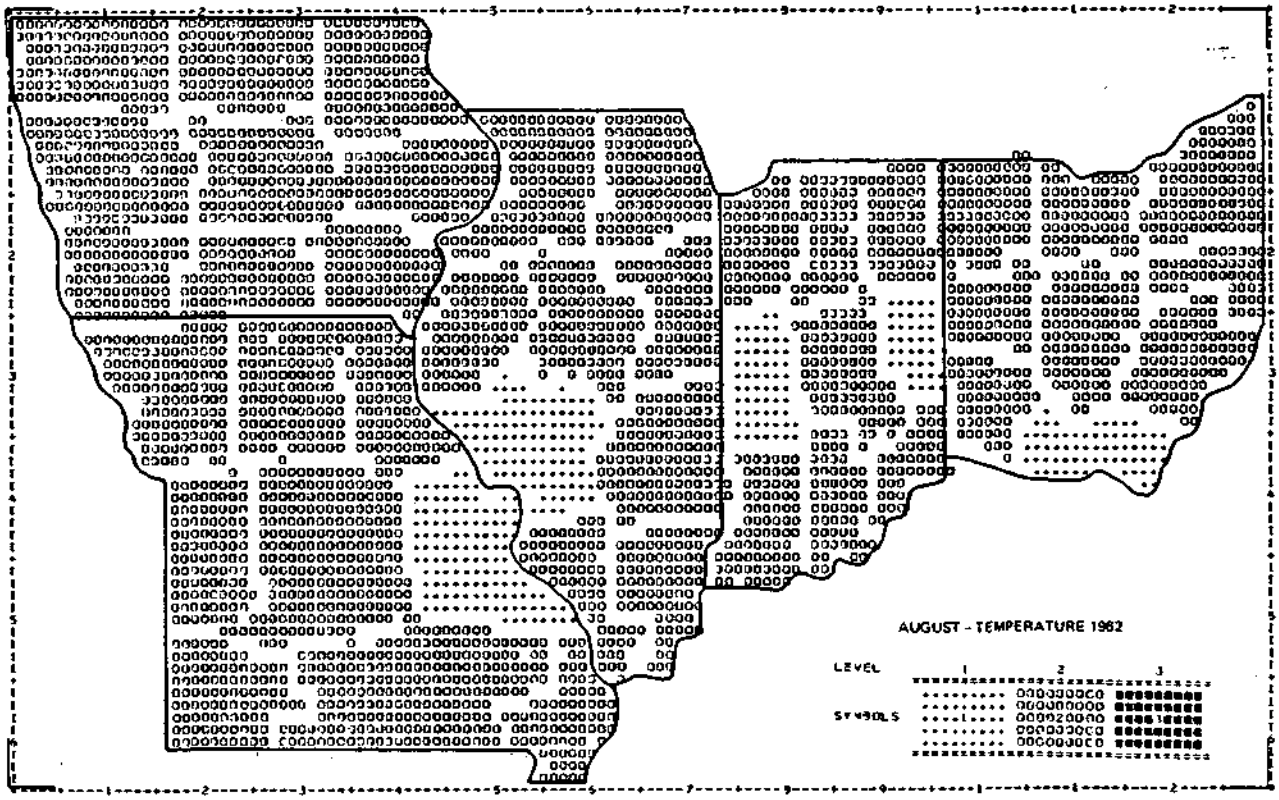

SOYBEANS - PERCENT DEVIATION FROM TREND 1959
LEVEL
1
2
3
SYMBOLS

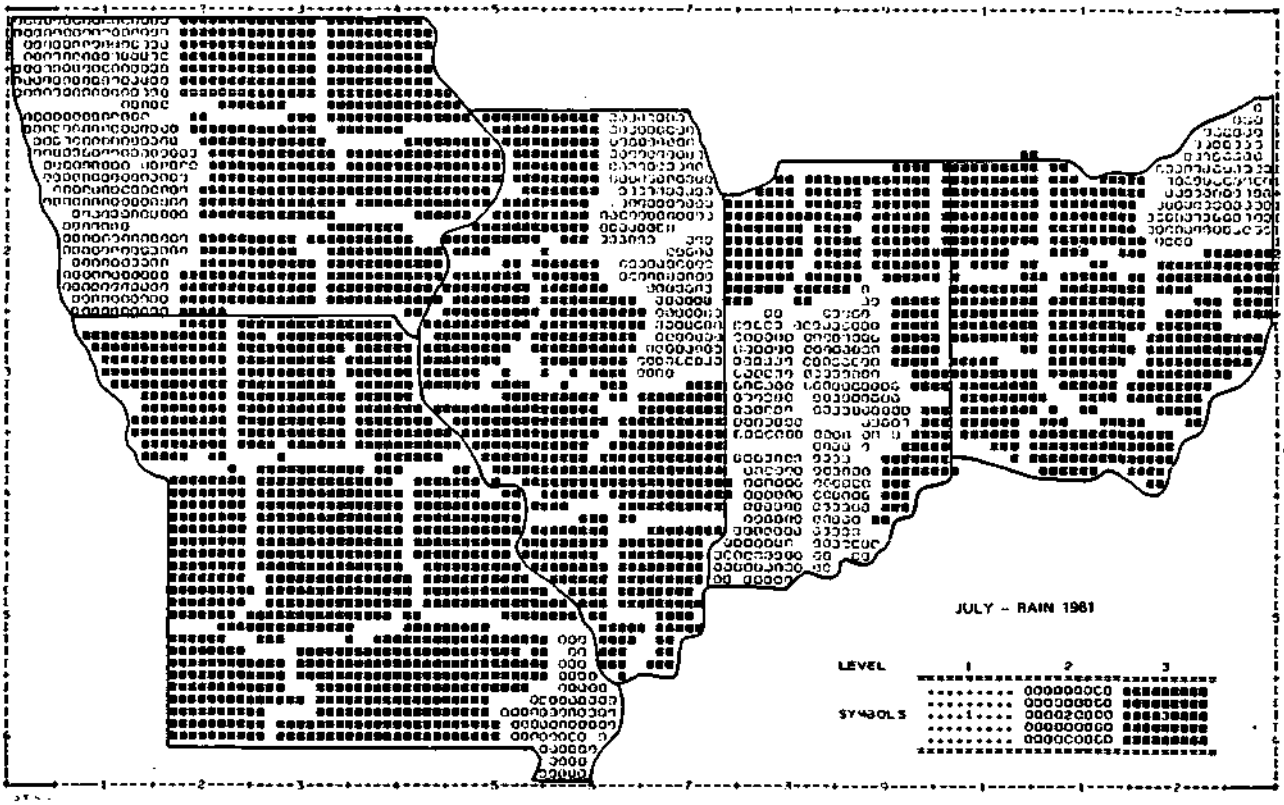

SOYBEANS - PERCENT DEVIATION FROM TREND 1960
LEVEL
1
2
3
SYMBOLS

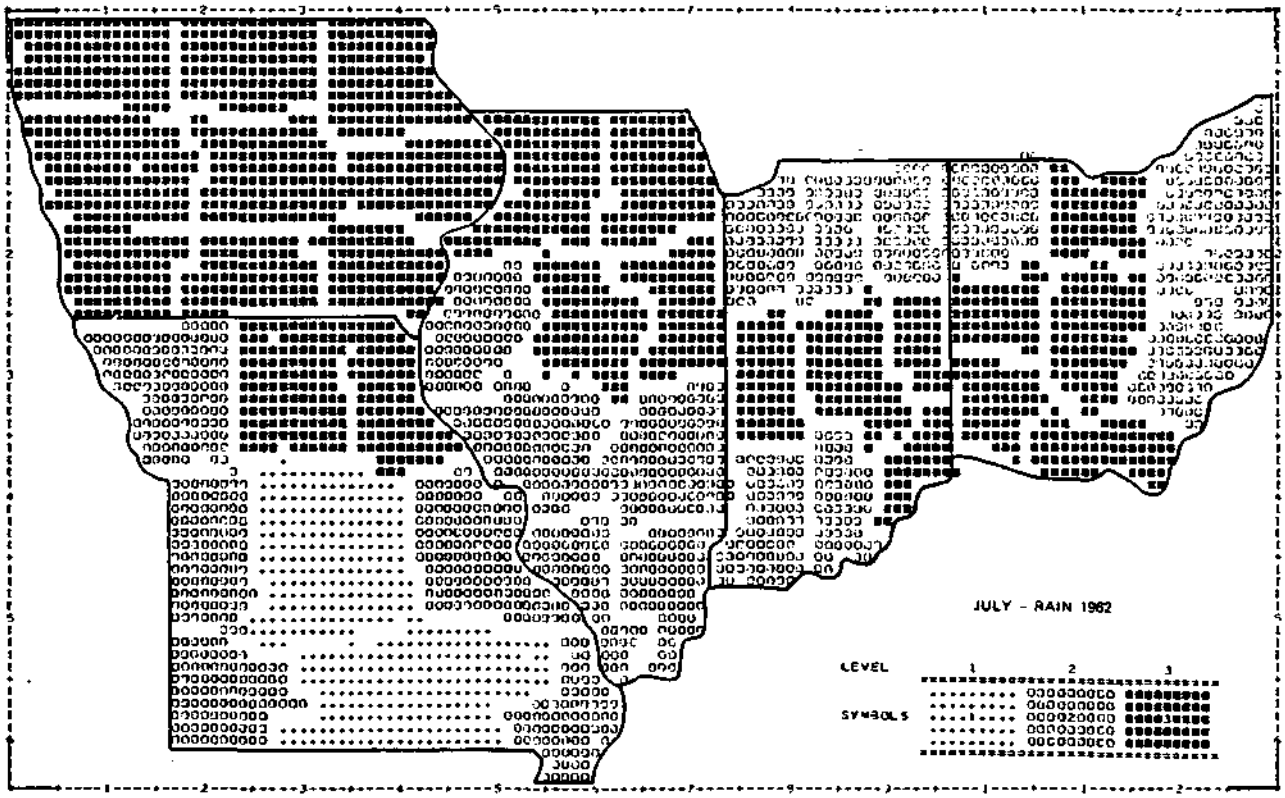

JULY - TEMPERATURE 1961
LEVEL
1
2
3
SYMBOLS

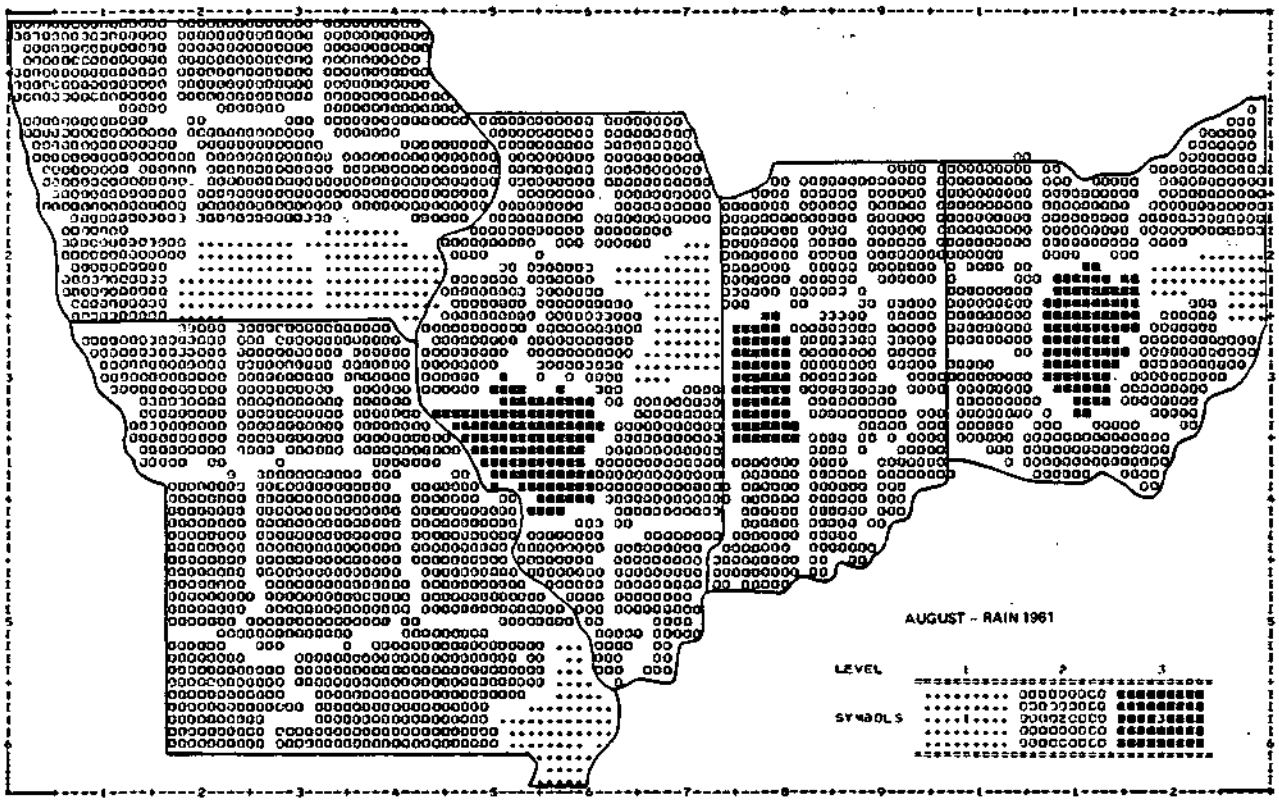

JULY - TEMPERATURE 1962
LEVEL
1
2
3
SYMBOLS

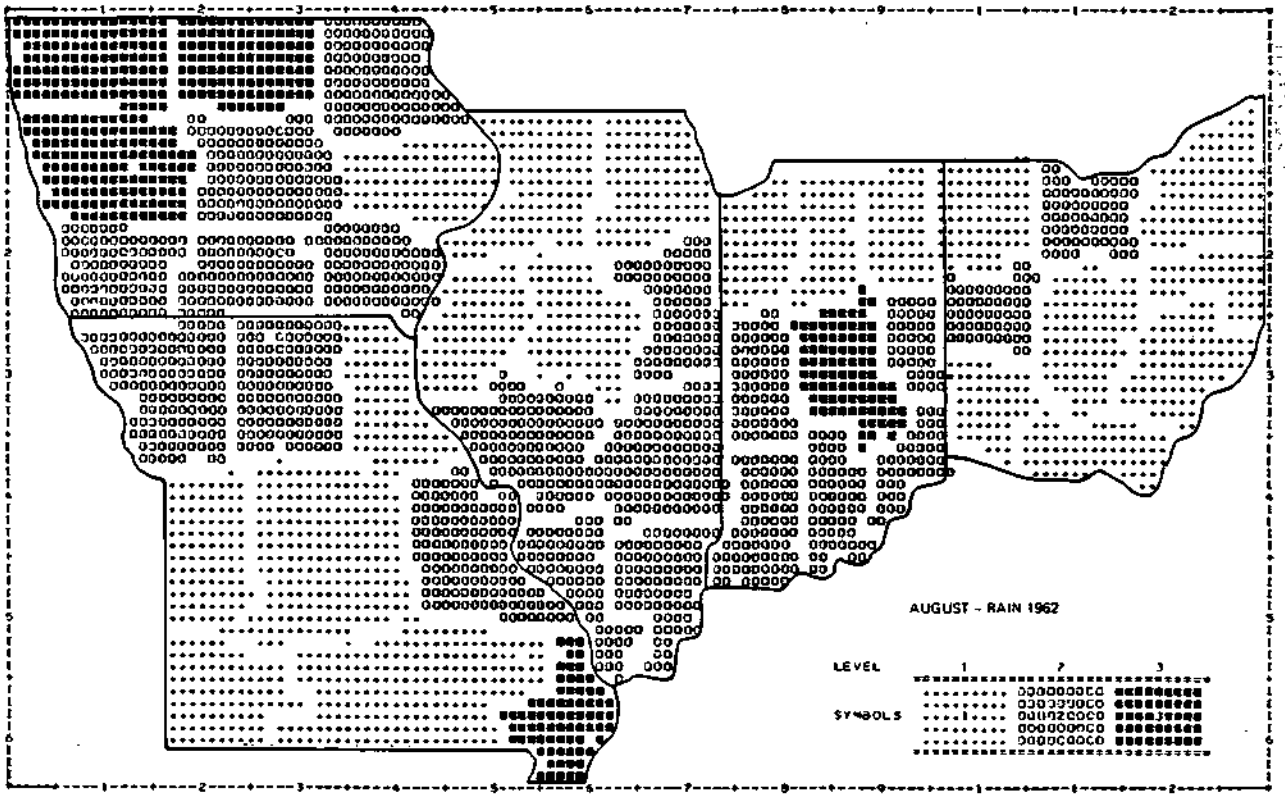

AUGUST - TEMPERATURE 1961
LEVEL
1
2
3

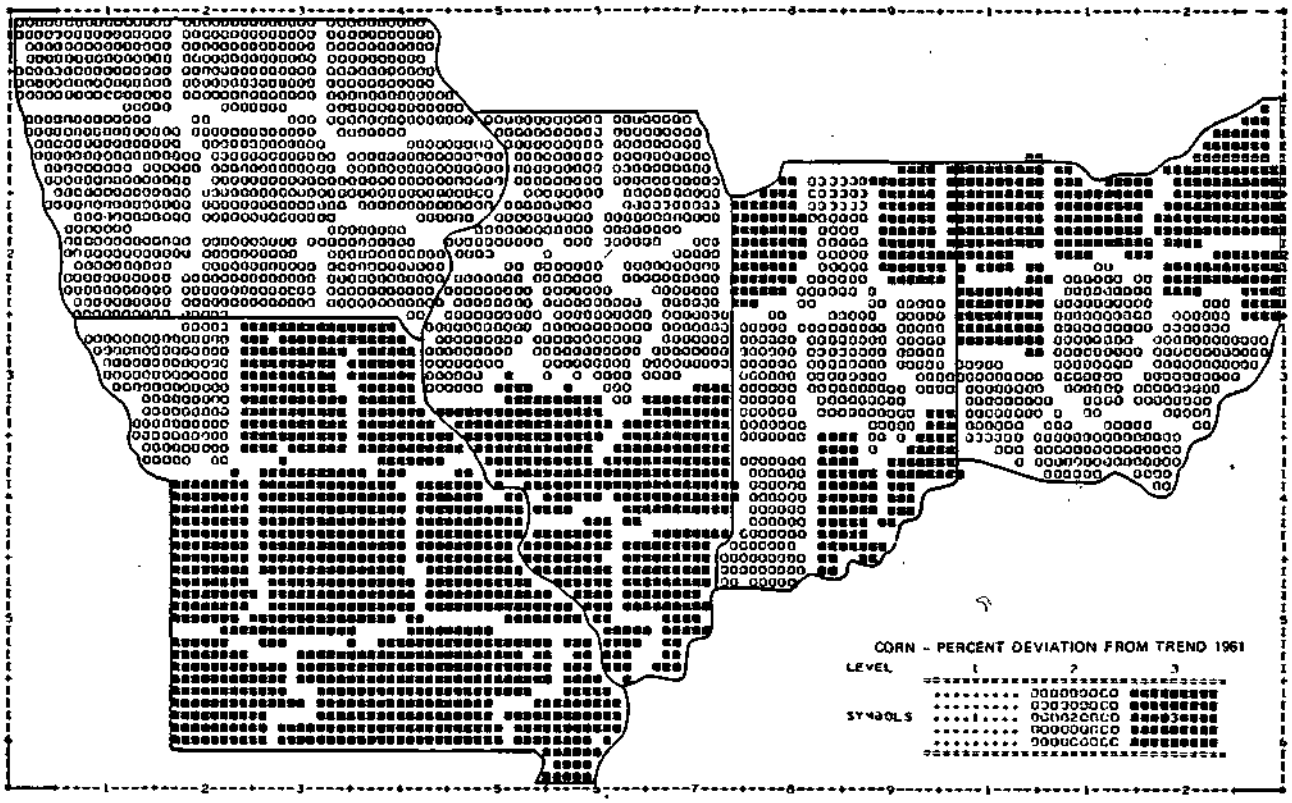

AUGUST - TEMPERATURE 1962
LEVEL
1
2
3

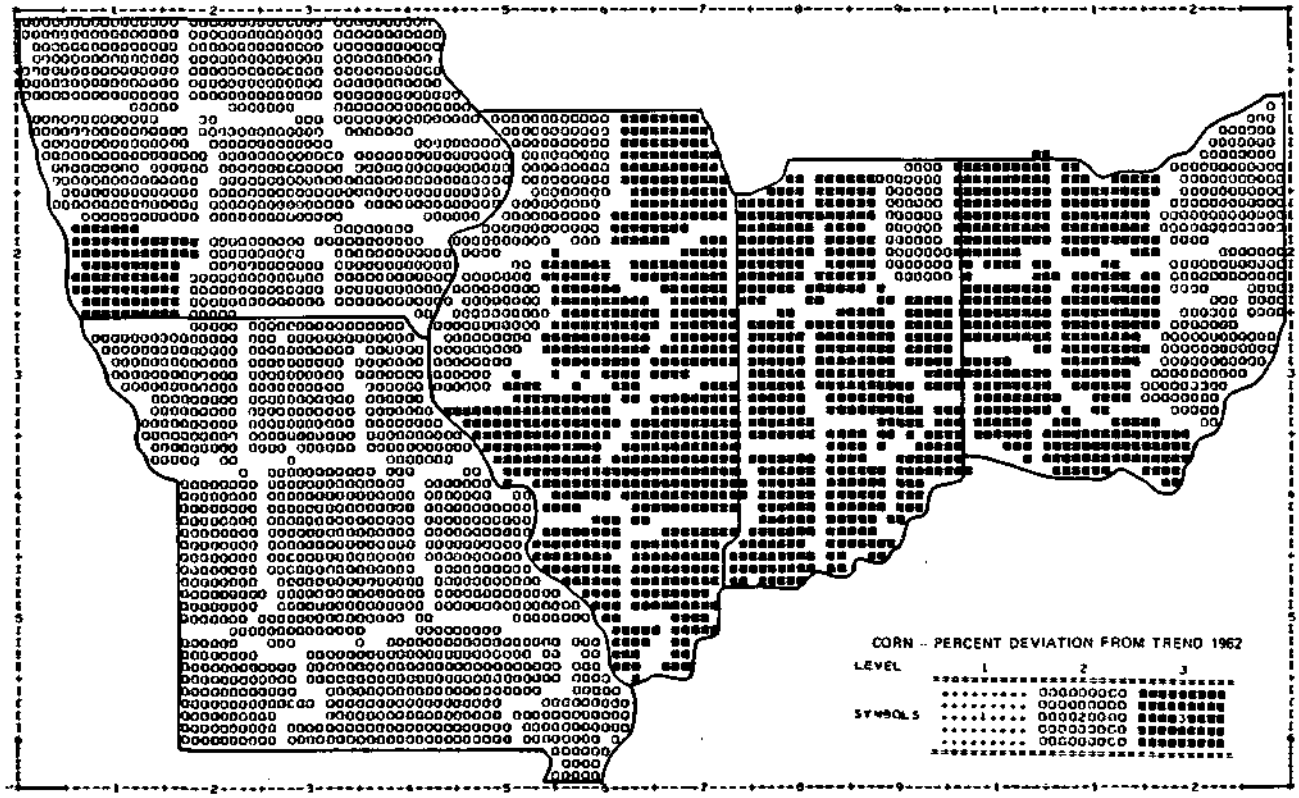

JULY - RAIN 1981
LEVEL
1
2
3
SYMBOLS

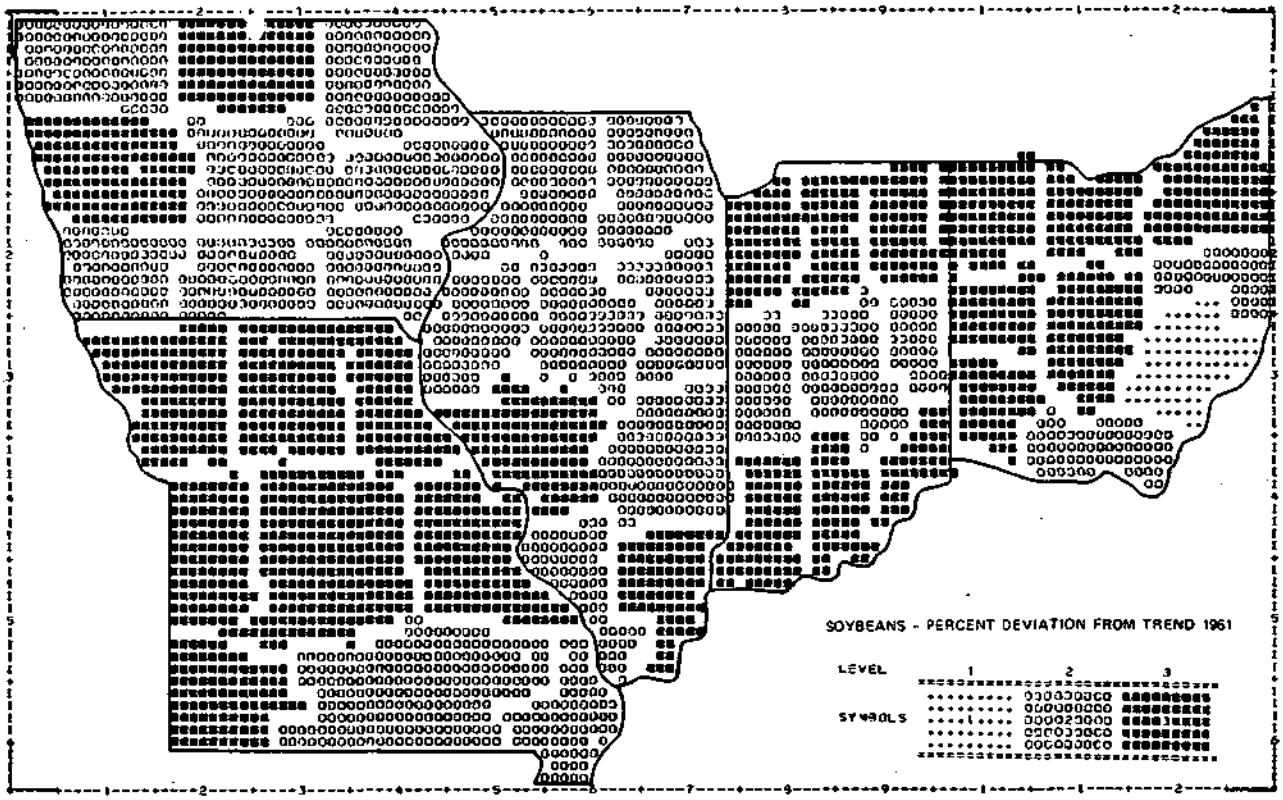

JULY - RAIN 1982
LEVEL
1
2
3
SYMBOLS

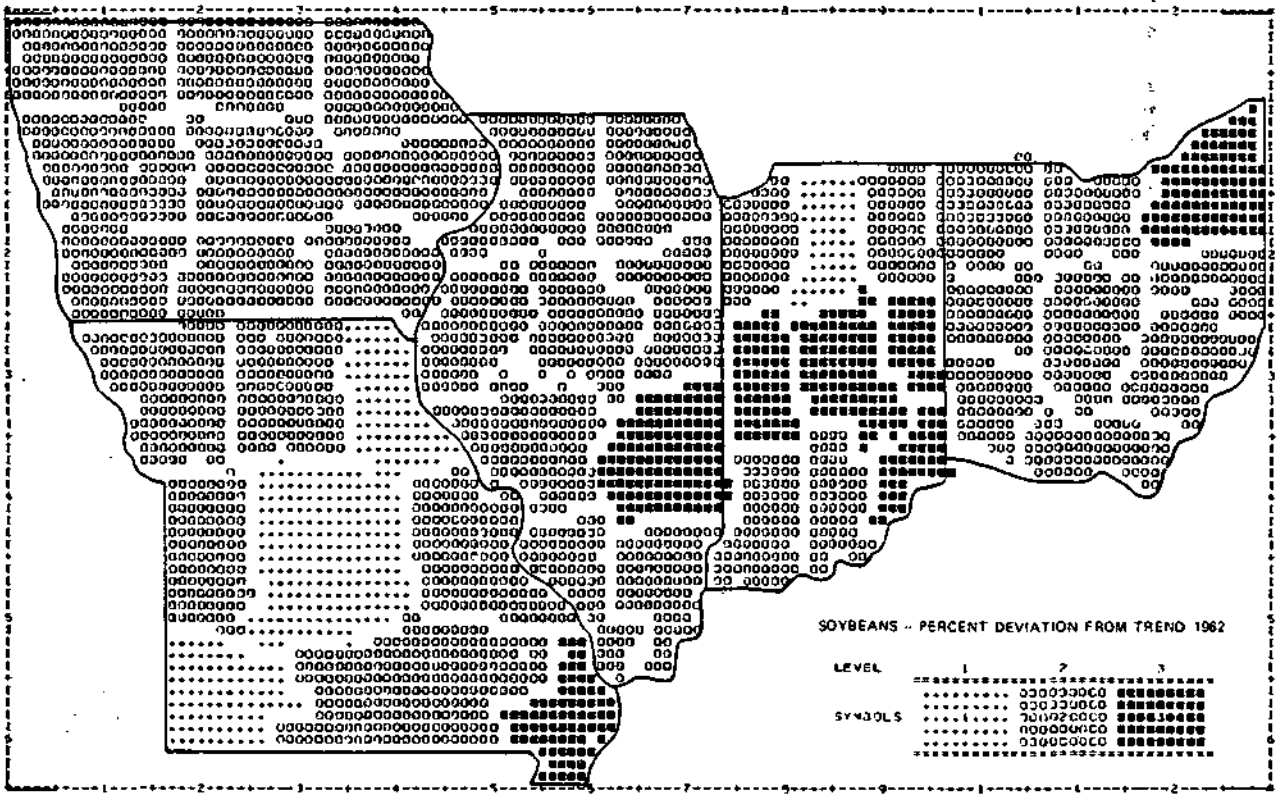

AUGUST - RAIN 1961
LEVEL
1
2
3
SYMBOLS

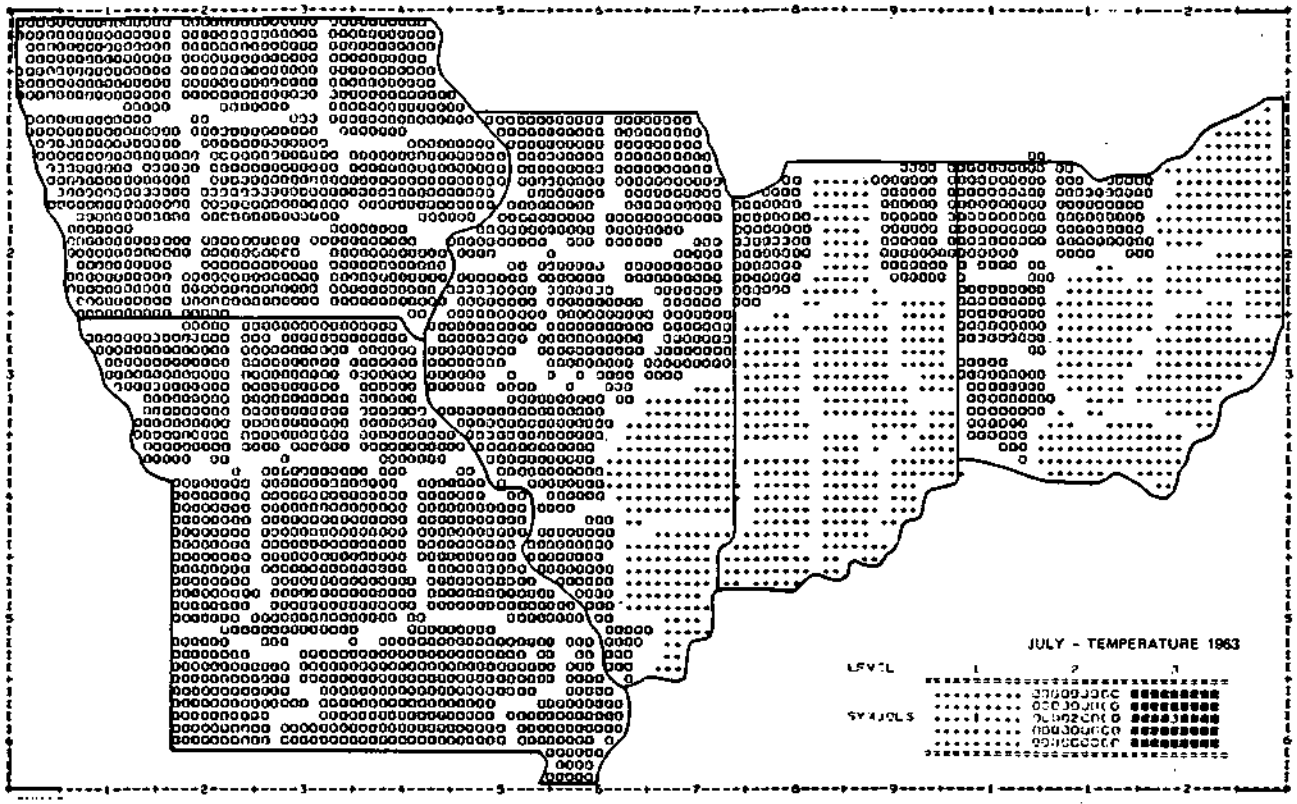

AUGUST - RAIN 1962
LEVEL
1
2
3
SYMBOLS

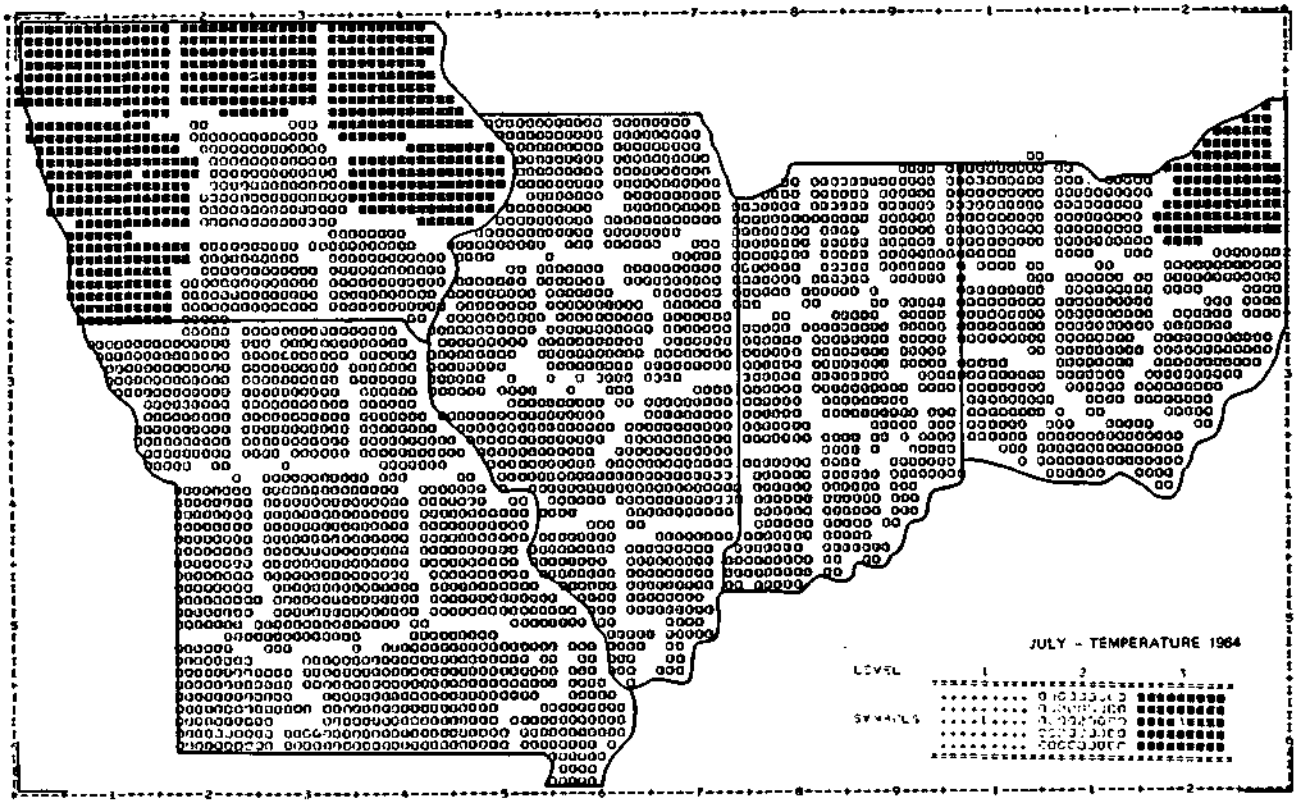

CORN - PERCENT DEVIATION FROM TREND 1961
LEVEL
1
2
3
SYMBOLS

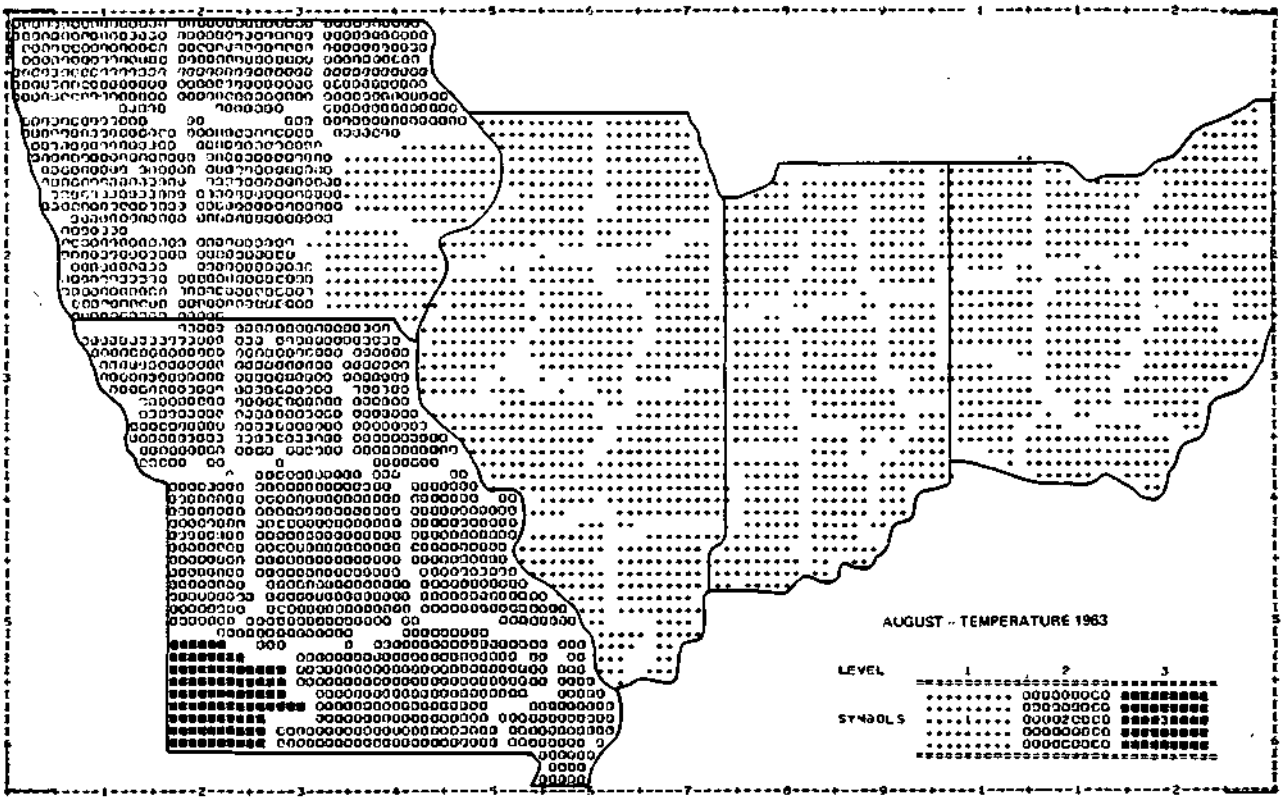

CORN - PERCENT DEVIATION FROM TREND 1962
LEVEL
1
2
3
SYMBOLS

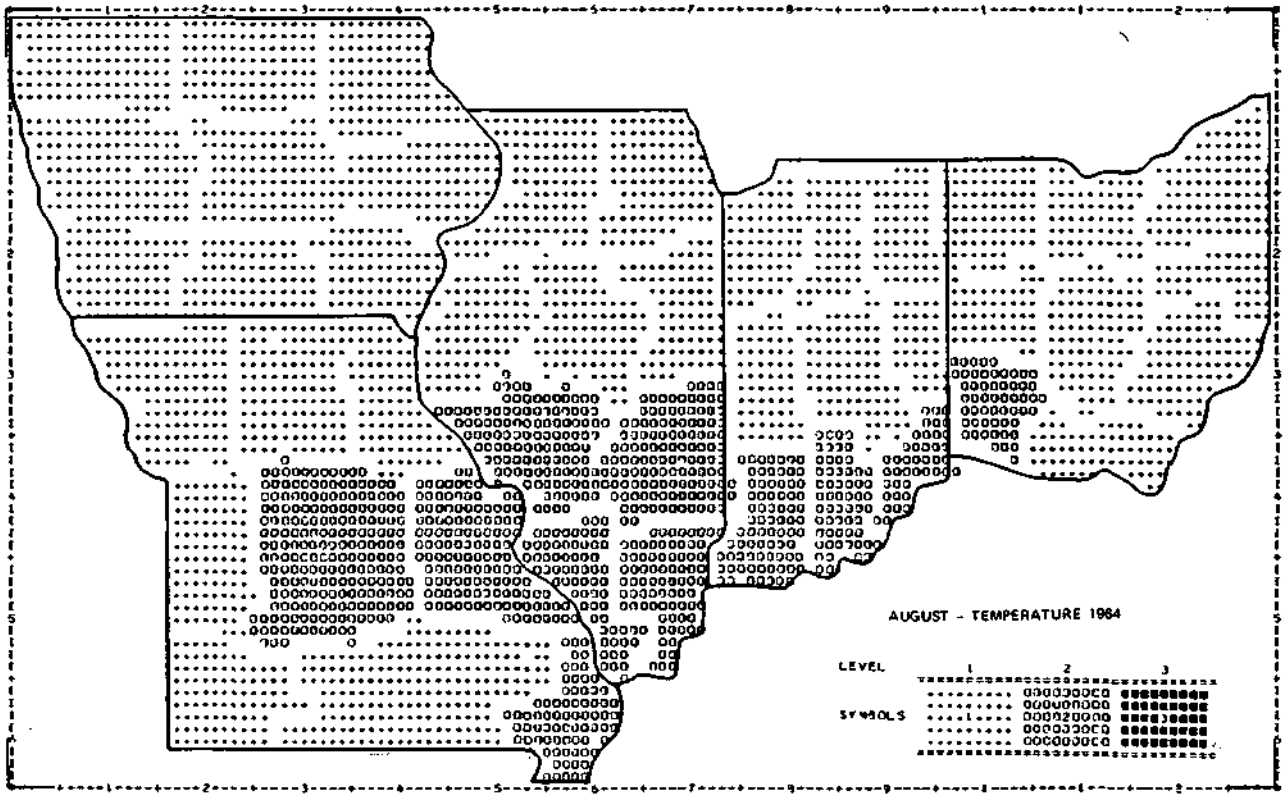

SOYBEANS - PERCENT DEVIATION FROM TREND 1961
LEVEL
1
2
3
SYMBOLS

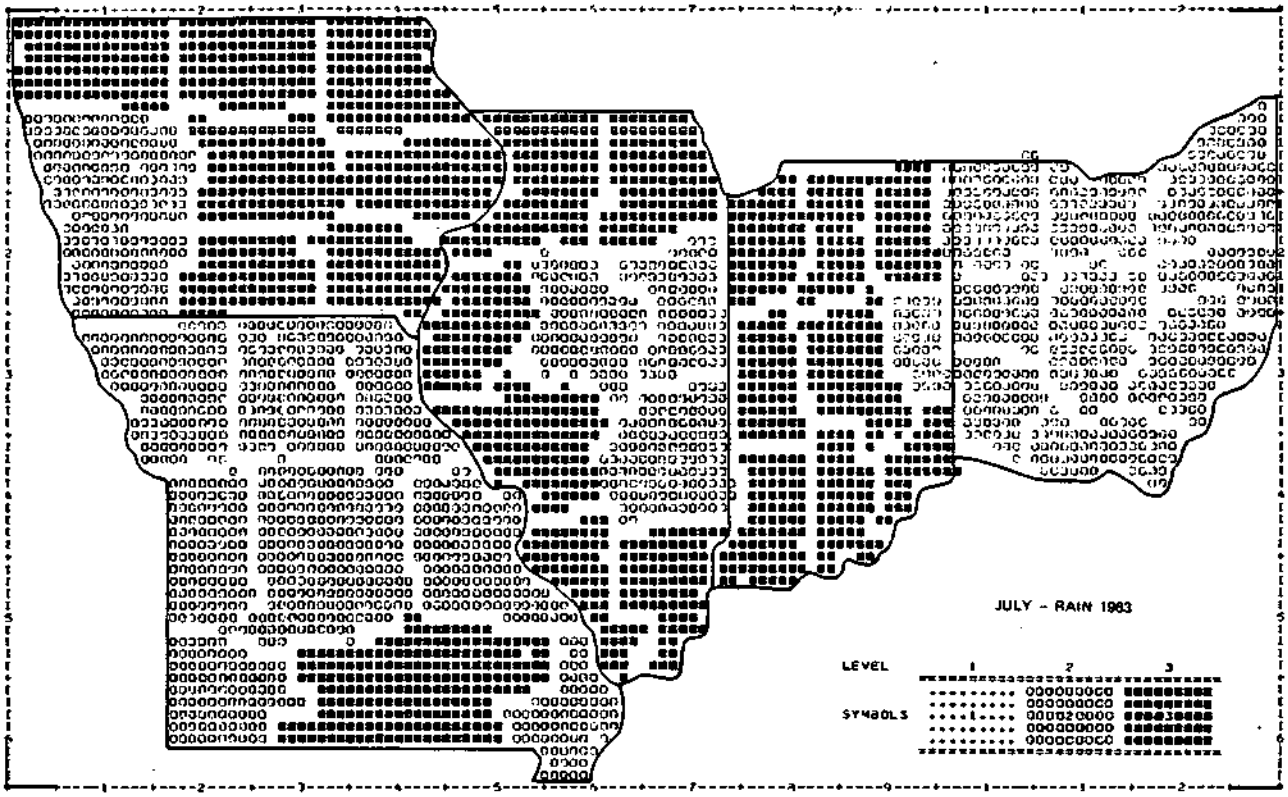

SOYBEANS - PERCENT DEVIATION FROM TREND 1962
LEVEL
1
2
3
SYMBOLS

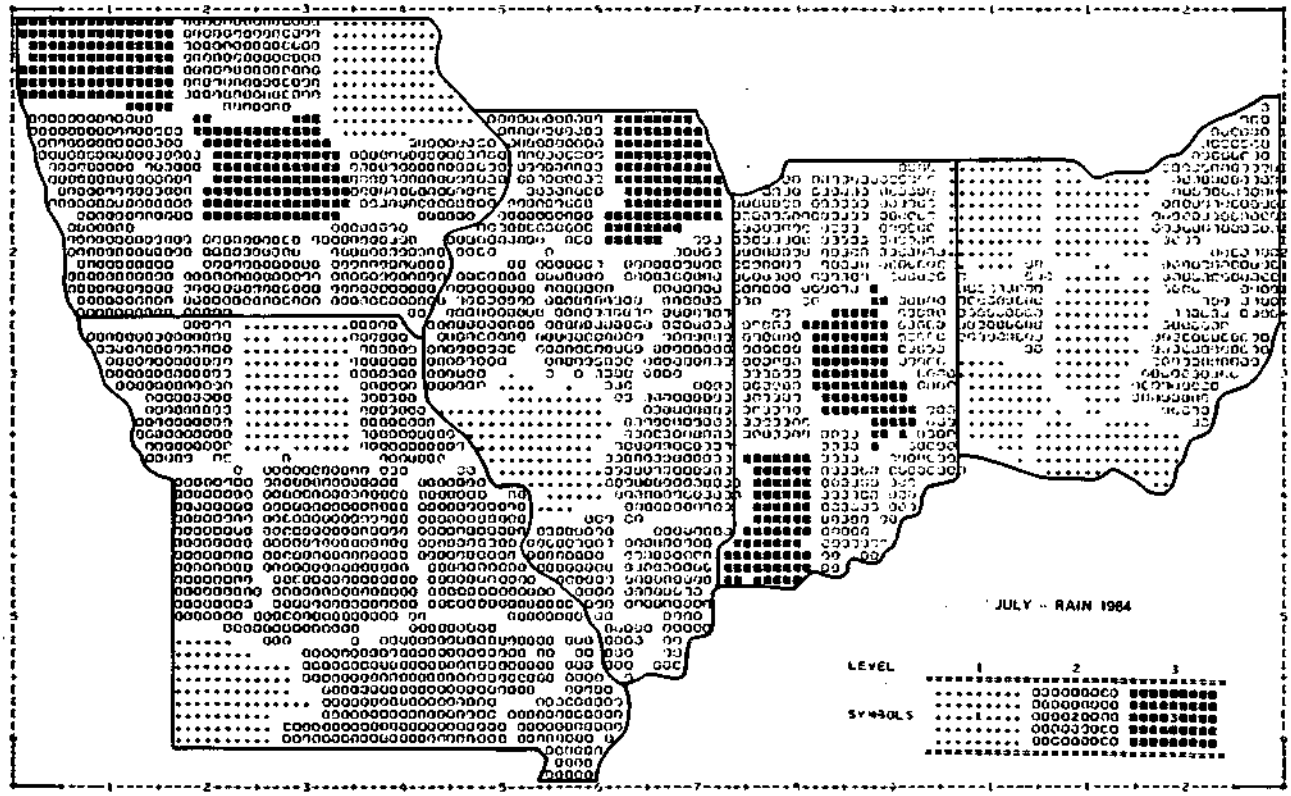

JULY - TEMPERATURE 1963
LEVEL
1
2
3
SYMBOLS

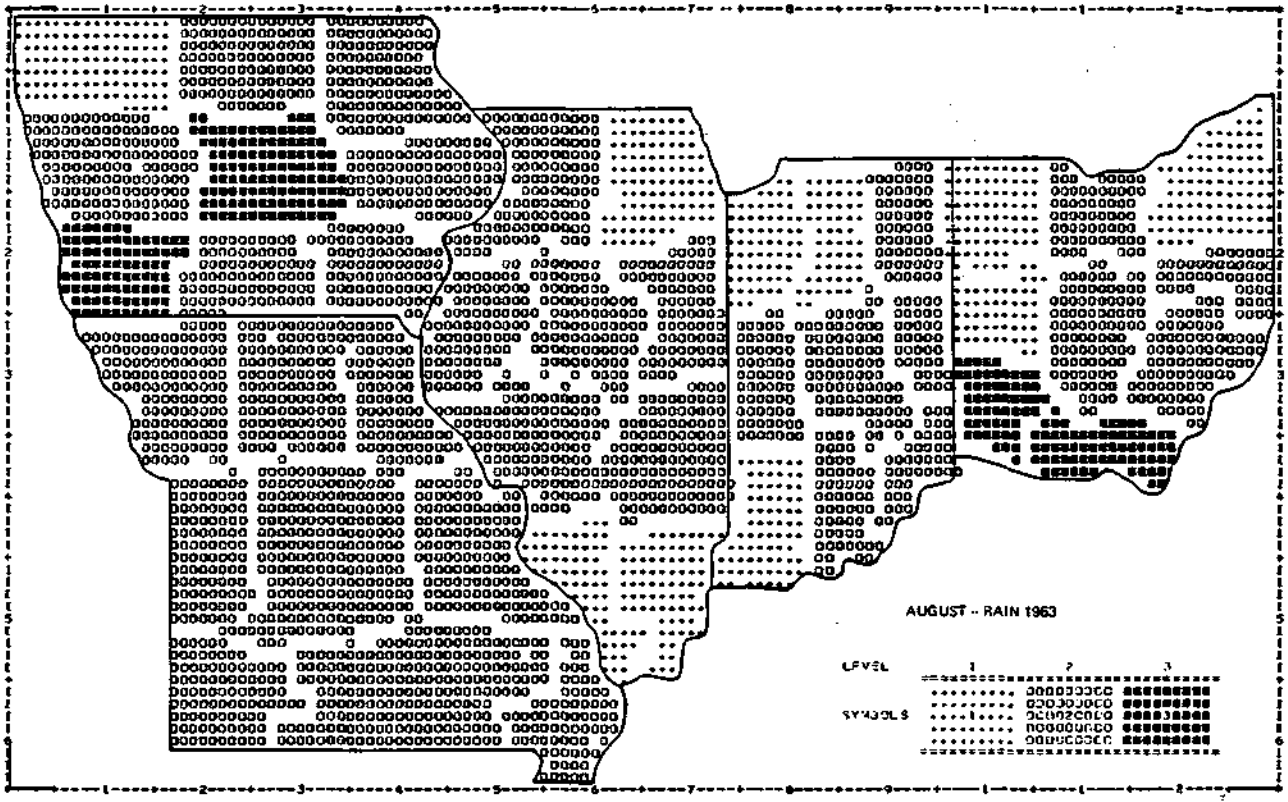

JULY - TEMPERATURE 1964
LEVEL
1
2
3
SYMBOLS

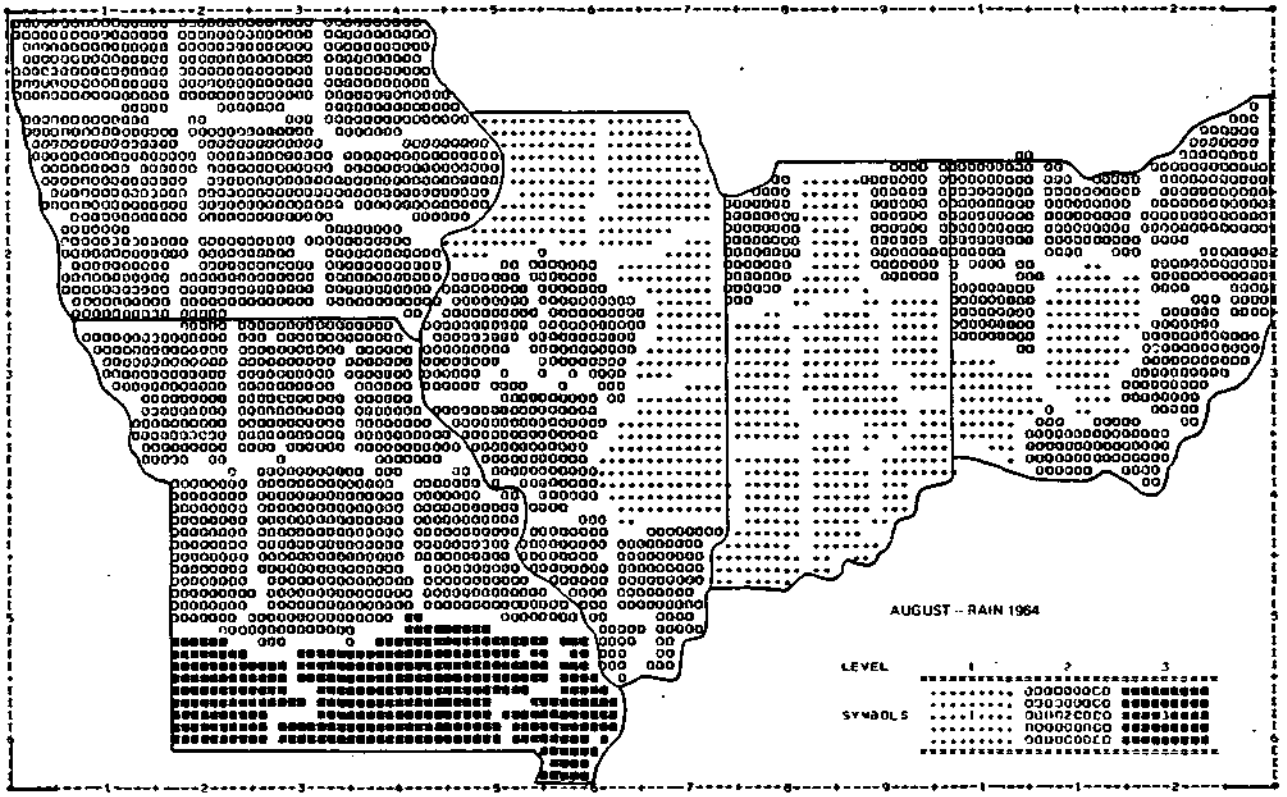

AUGUST - TEMPERATURE 1983
LEVEL
1
2
3
SYMBOLS

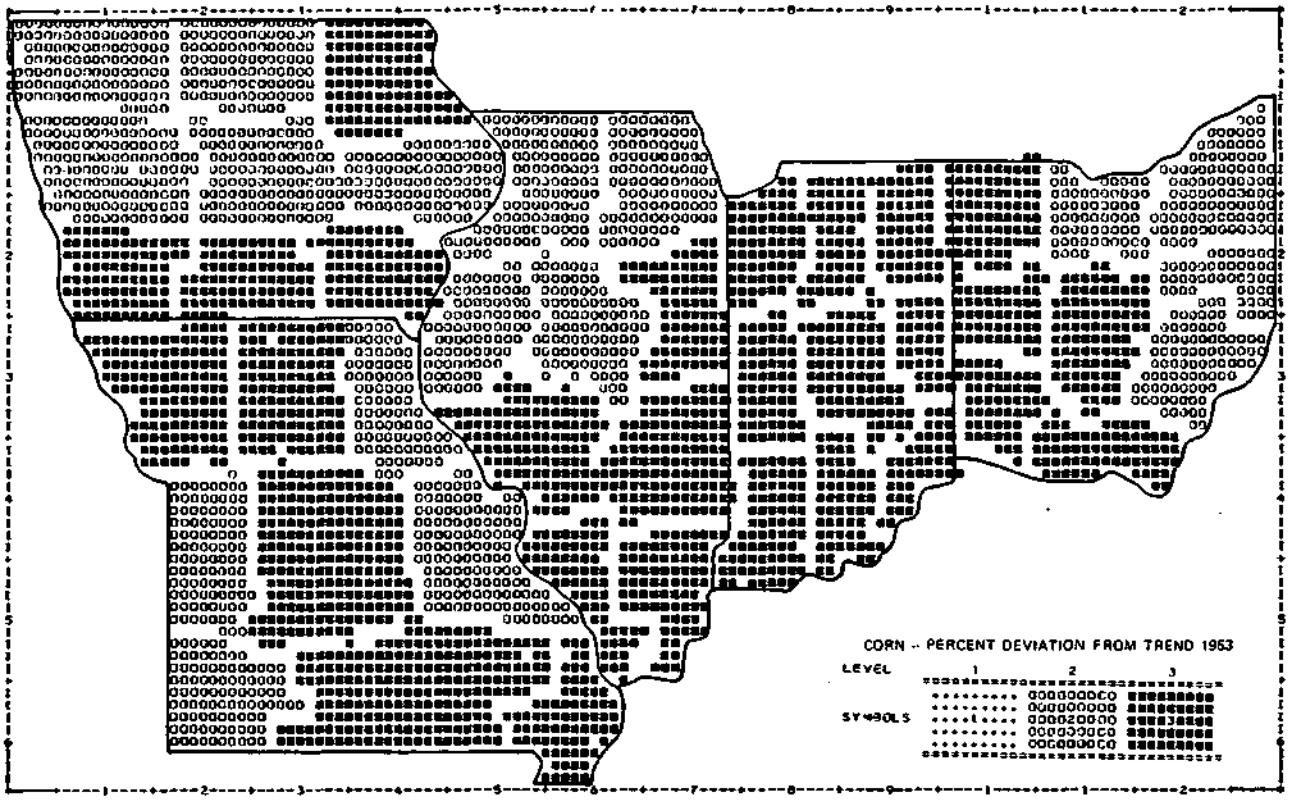

AUGUST - TEMPERATURE 1984
LEVEL
1
2
3
SYMBOLS

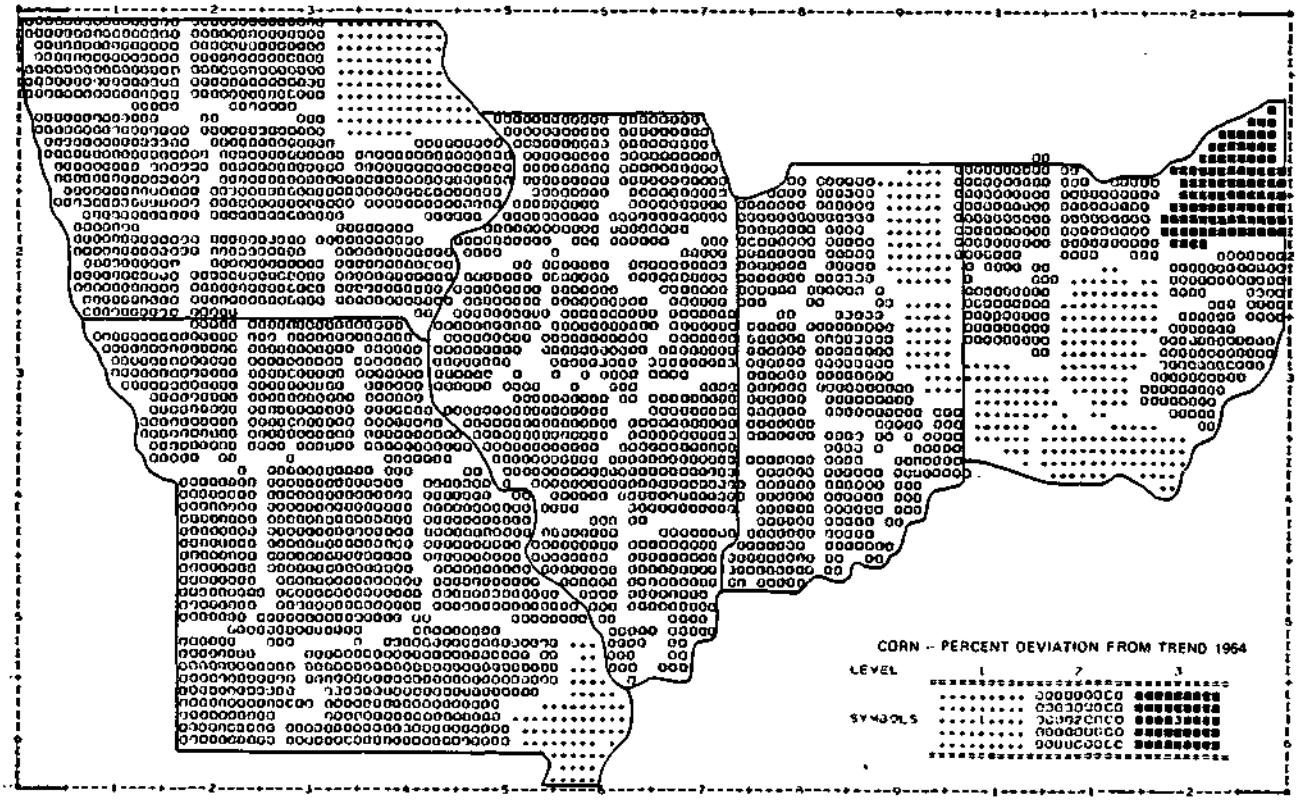

JULY - RAIN 1983
LEVEL
1
2
3
SYMBOLS

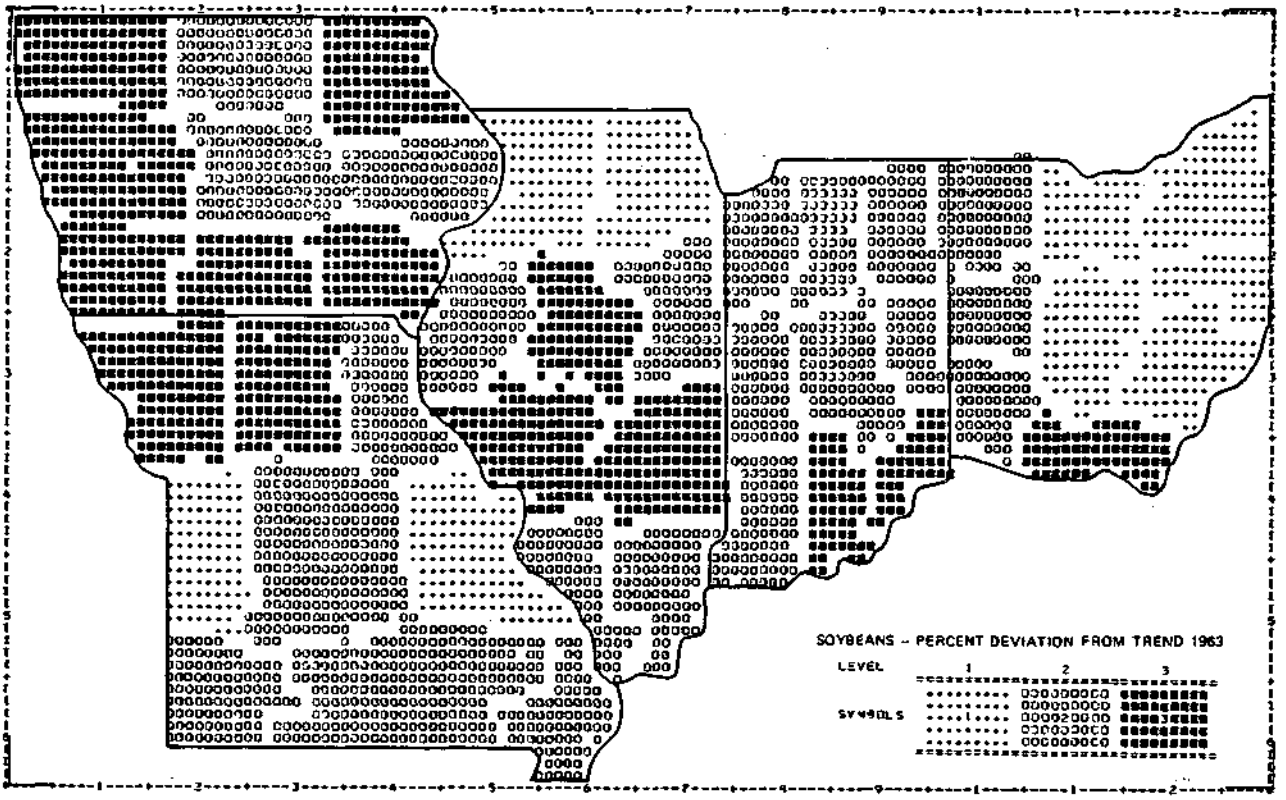

JULY - RAIN 1984
LEVEL
1
2
3
SYMBOLS

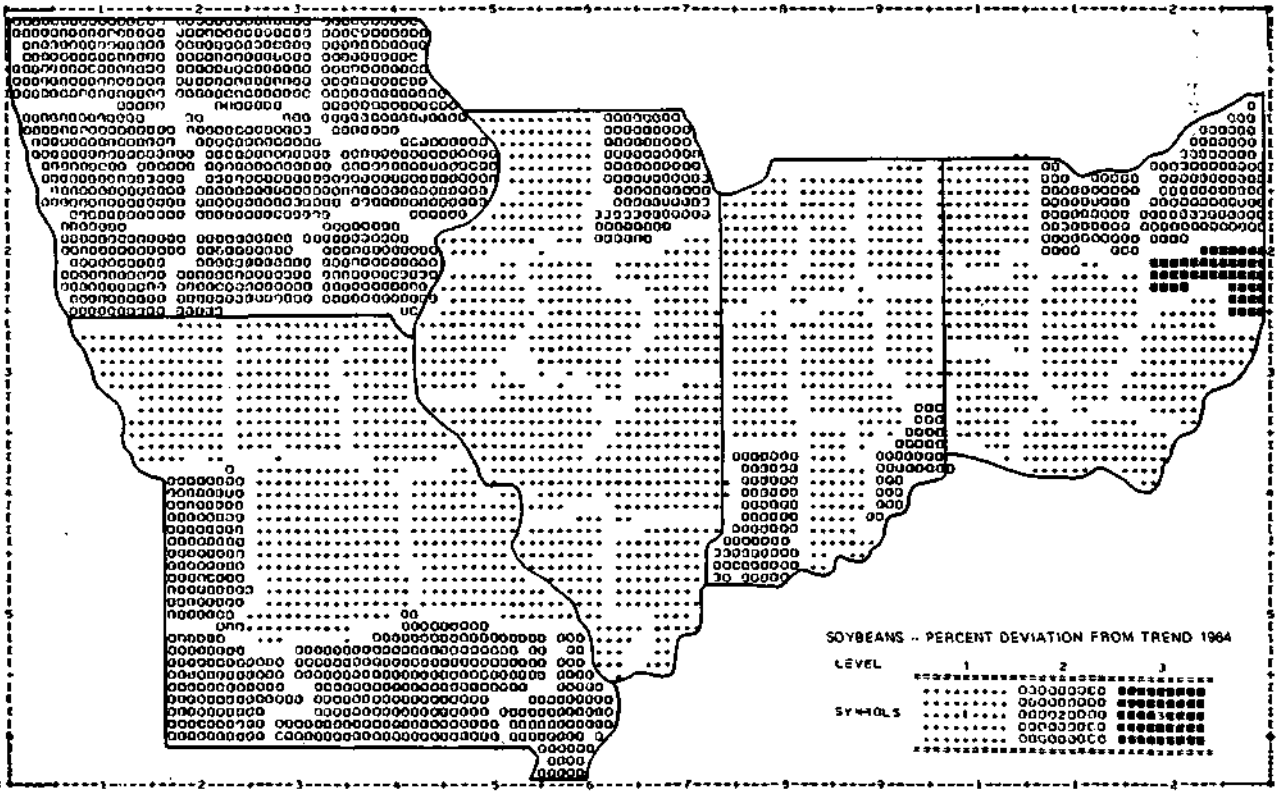

AUGUST -- RAIN 1963
LEVEL
1
2
3
SYMBOLS

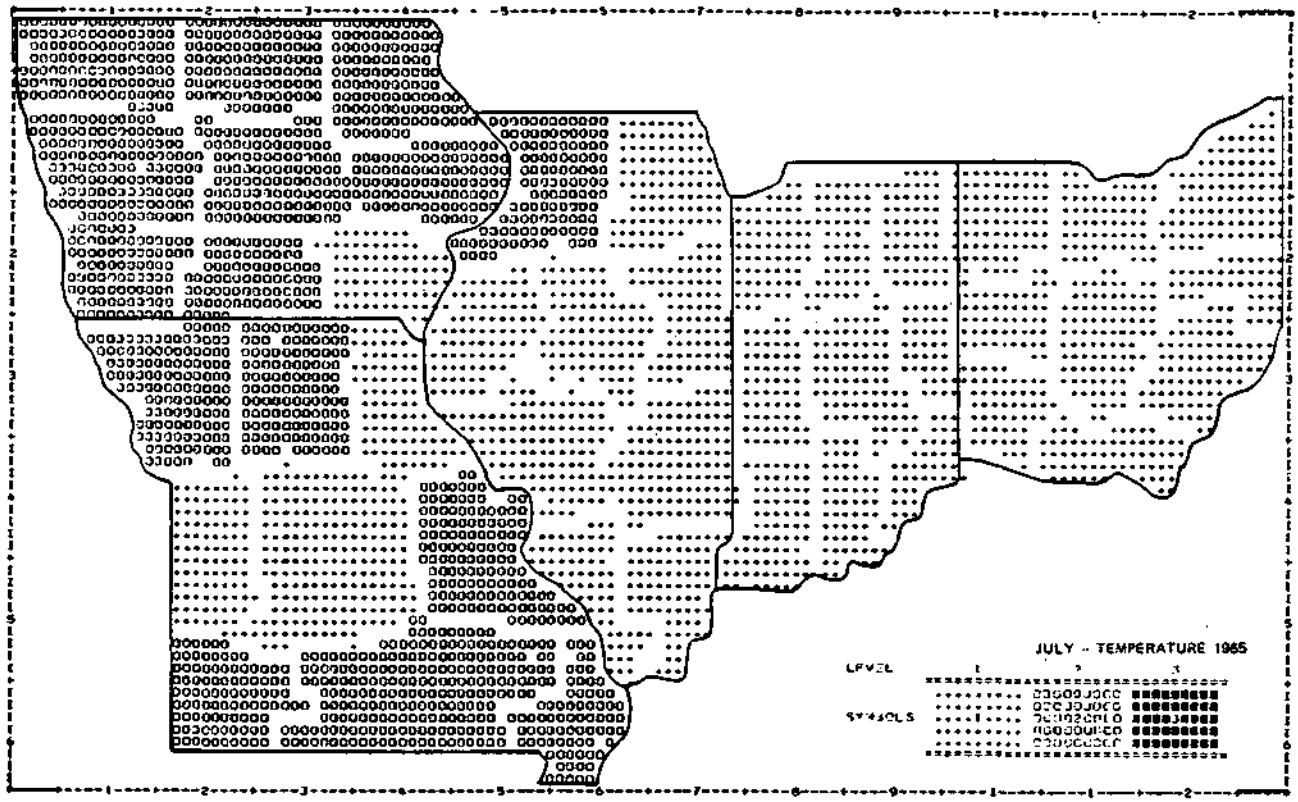

AUGUST -- RAIN 1964
LEVEL
1
2
3
SYMBOLS

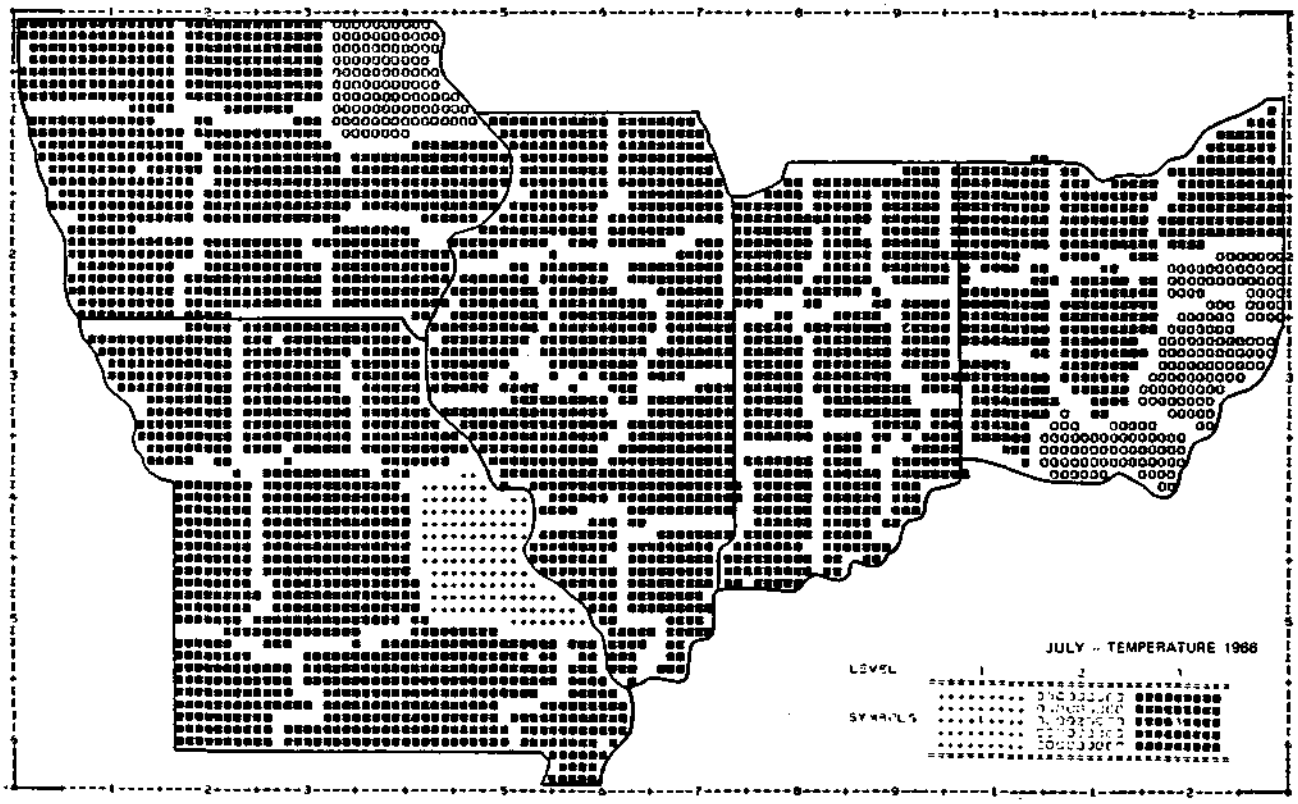

CORN -- PERCENT DEVIATION FROM TREND 1963
LEVEL
1
2
3
SY49OLS

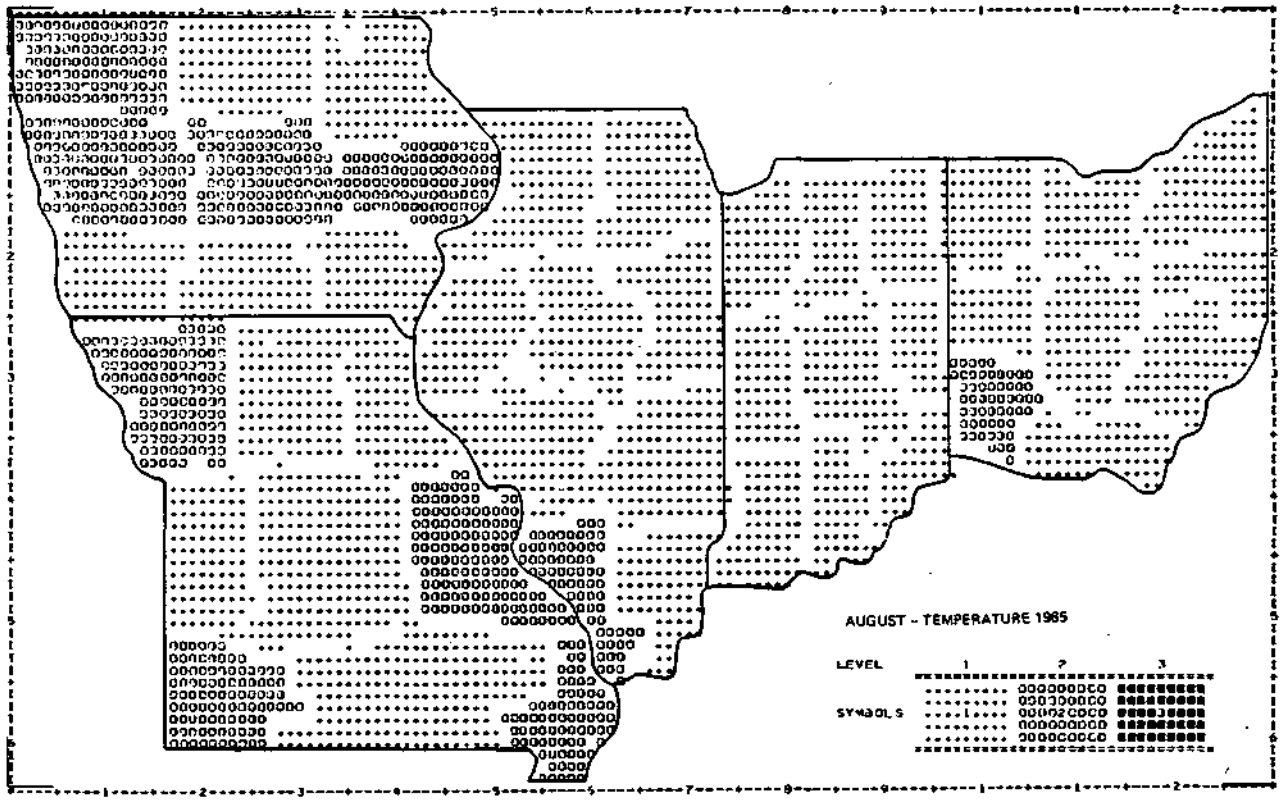

CORN -- PERCENT DEVIATION FROM TREND 1964
LEVEL
1
2
3
SY49OLS

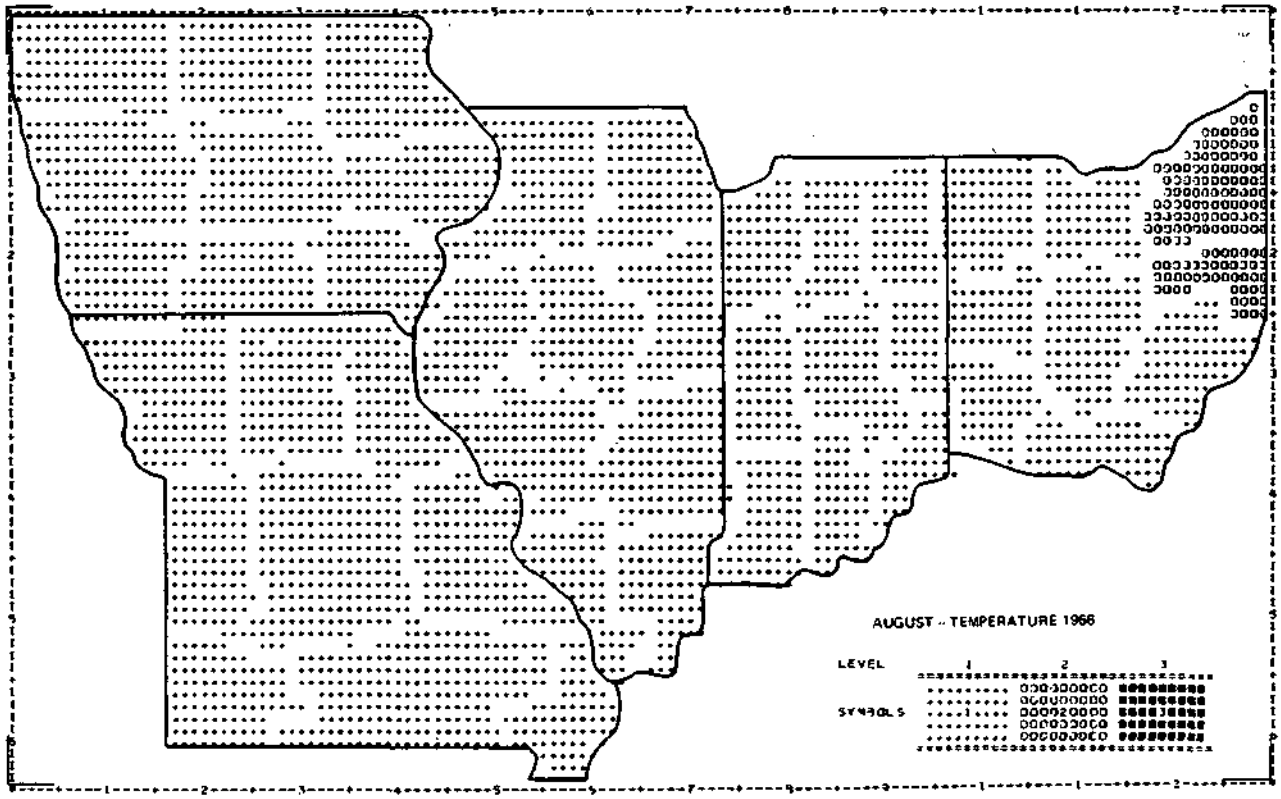

SOYBEANS -- PERCENT DEVIATION FROM TREND 1963
LEVEL
1
2
3
SYMBOLS

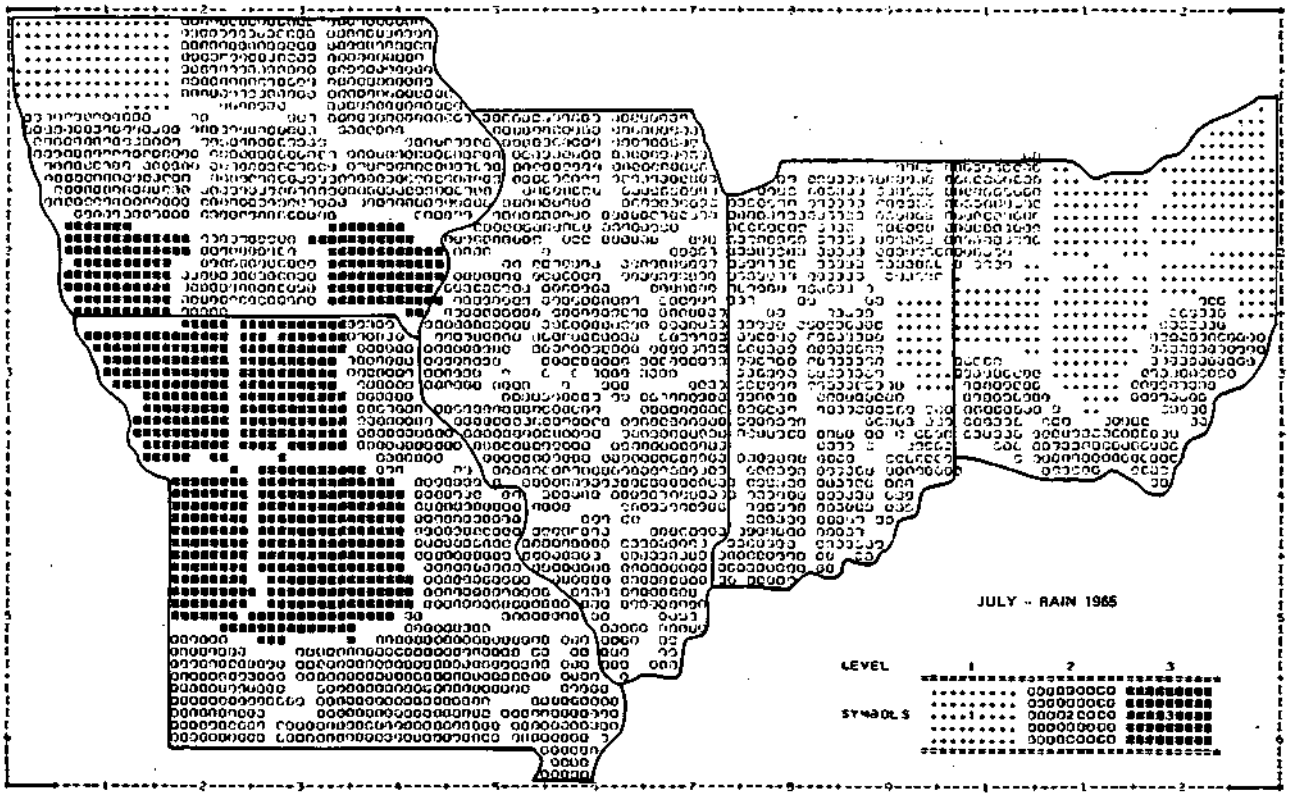

SOYBEANS -- PERCENT DEVIATION FROM TREND 1964
LEVEL
1
2
3
SYMBOLS


JULY - TEMPERATURE 1965
LEVEL
SYMBOLS


JULY - TEMPERATURE 1966
LEVEL
SYMBOLS


AUGUST - TEMPERATURE 1965
LEVEL
1
2
3
SYMBOLS


AUGUST - TEMPERATURE 1966
LEVEL
1
2
3
SYMBOLS


JULY - RAIN 1965
LEVEL
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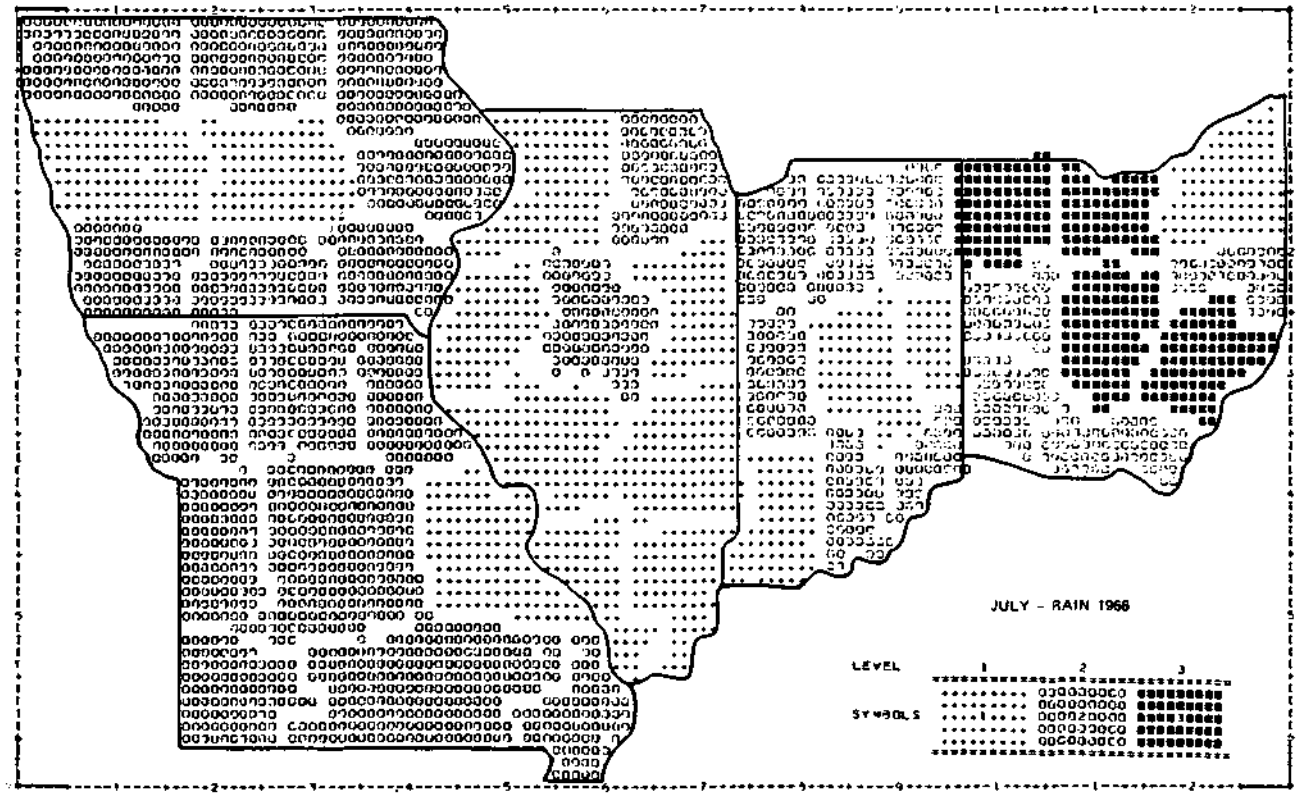
SYMBOLS


JULY - RAIN 1966
LEVEL
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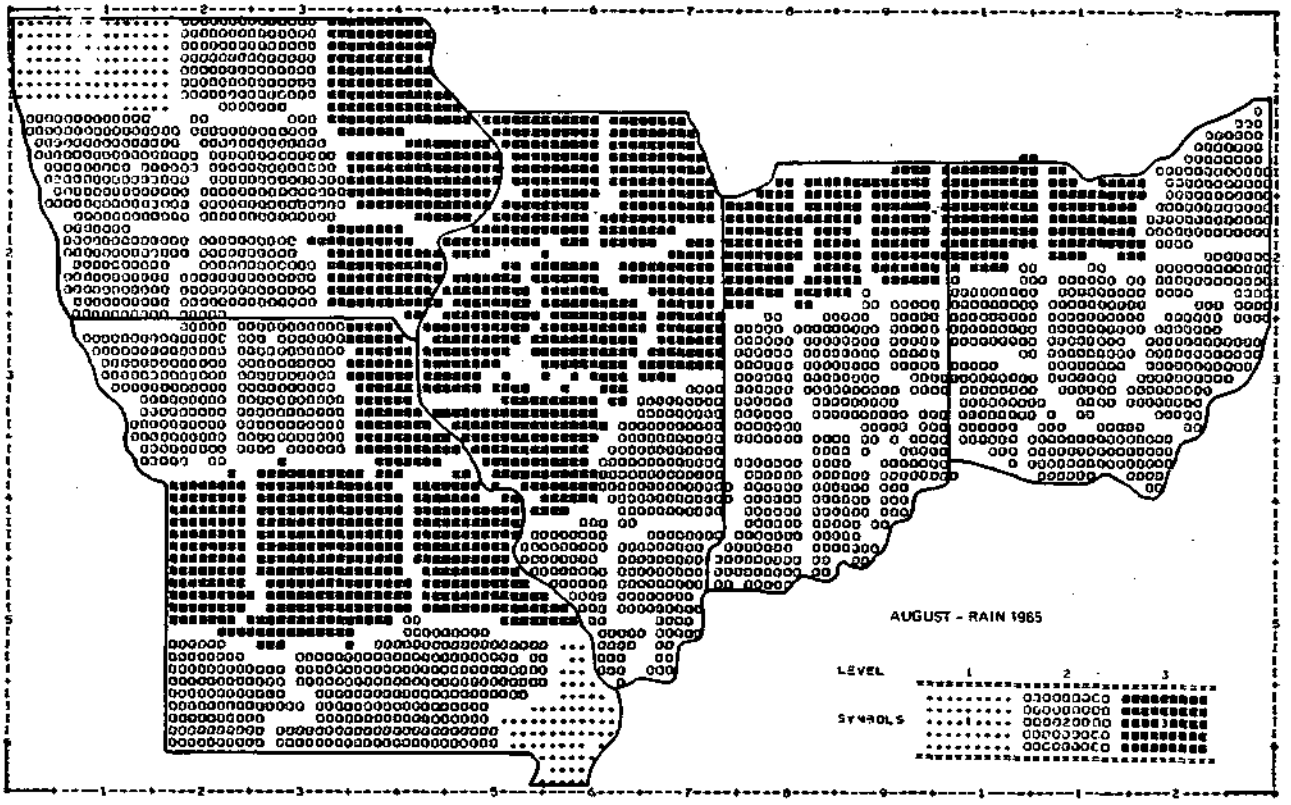
SYMBOLS


AUGUST - RAIN 1965
LEVEL
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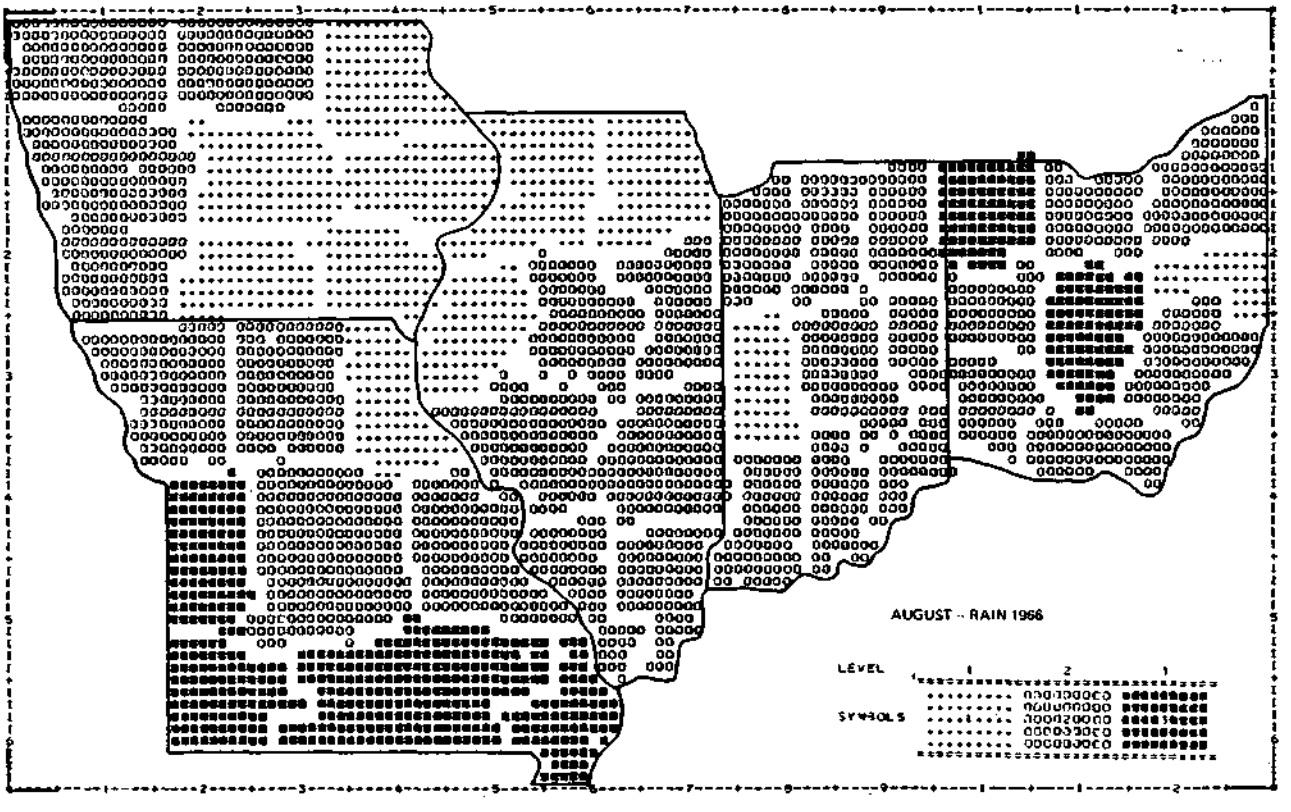
SYMBOLS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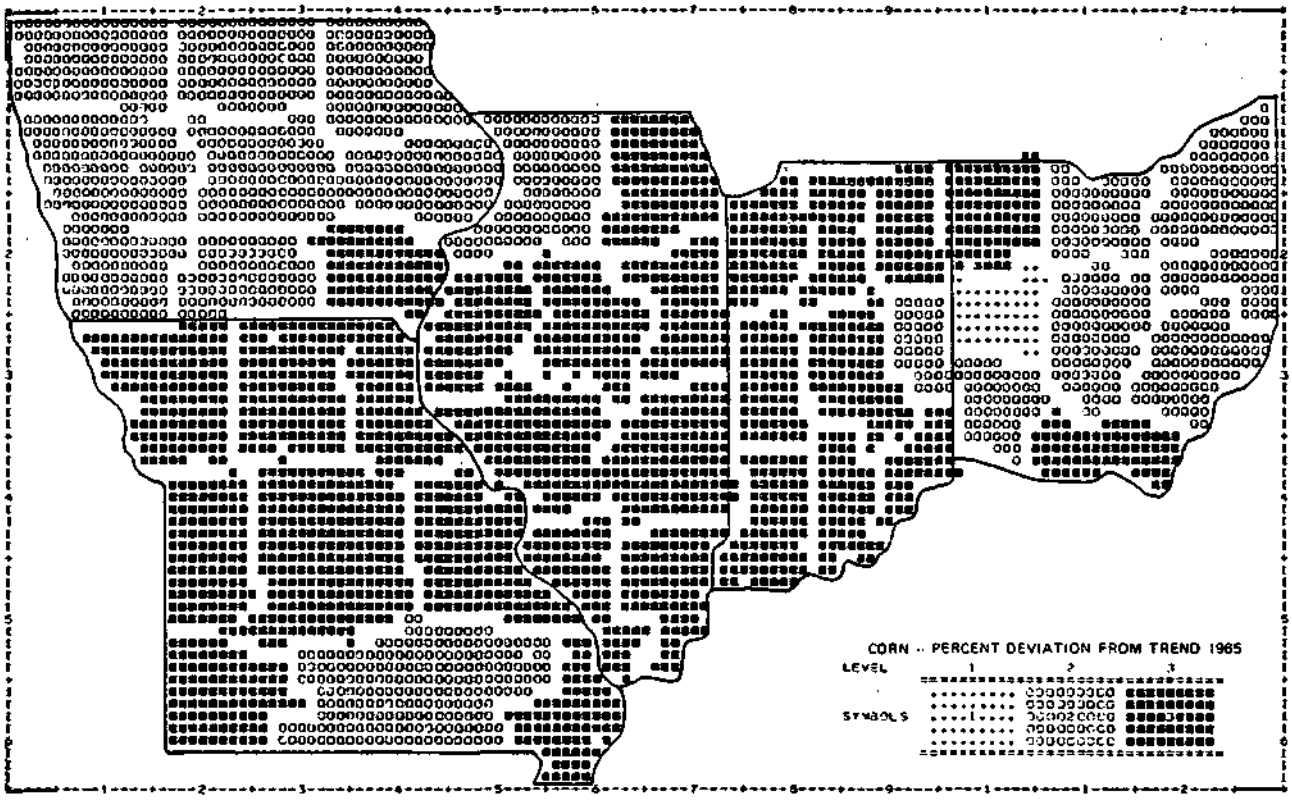
SYMBOLS


CORN -- PERCENT DEVIATION FROM TREND 1965
LEVEL
1
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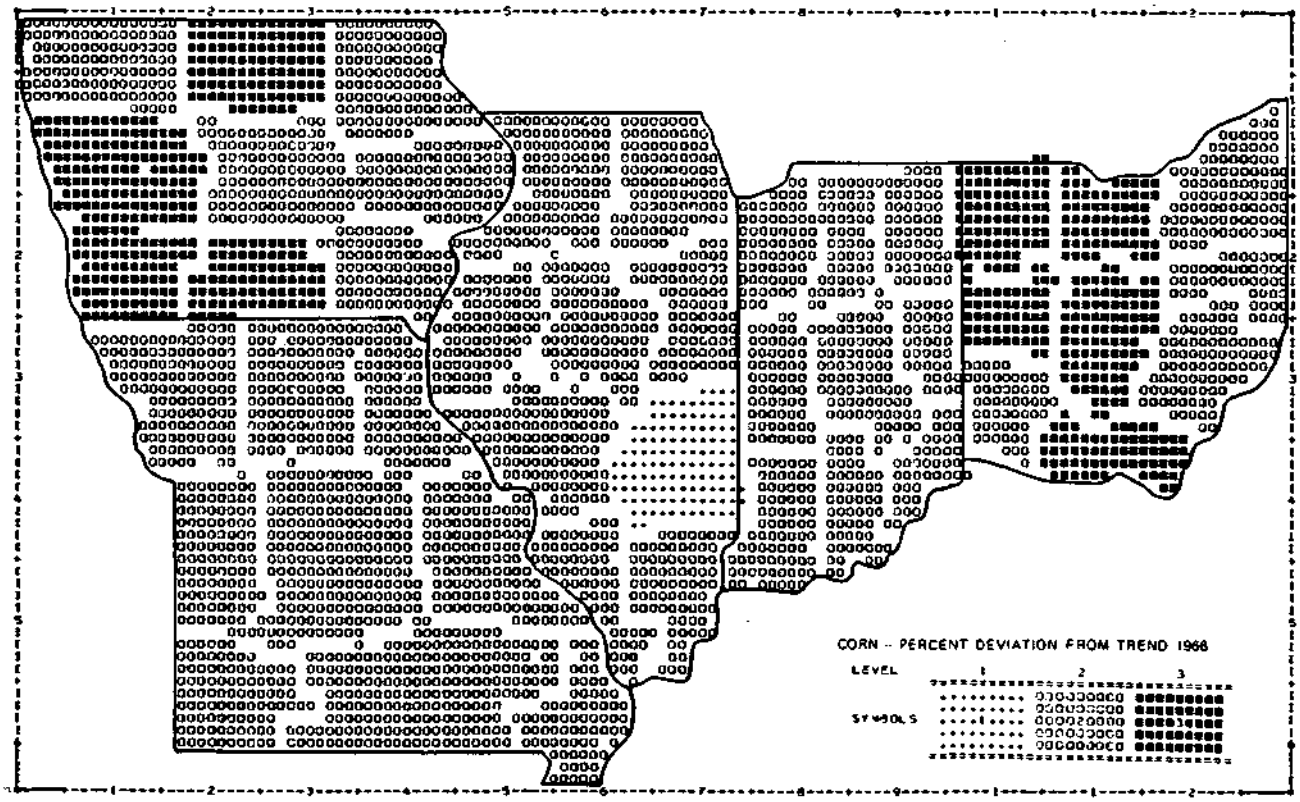
SYMBOLS


CORN -- PERCENT DEVIATION FROM TREND 1968
LEVEL
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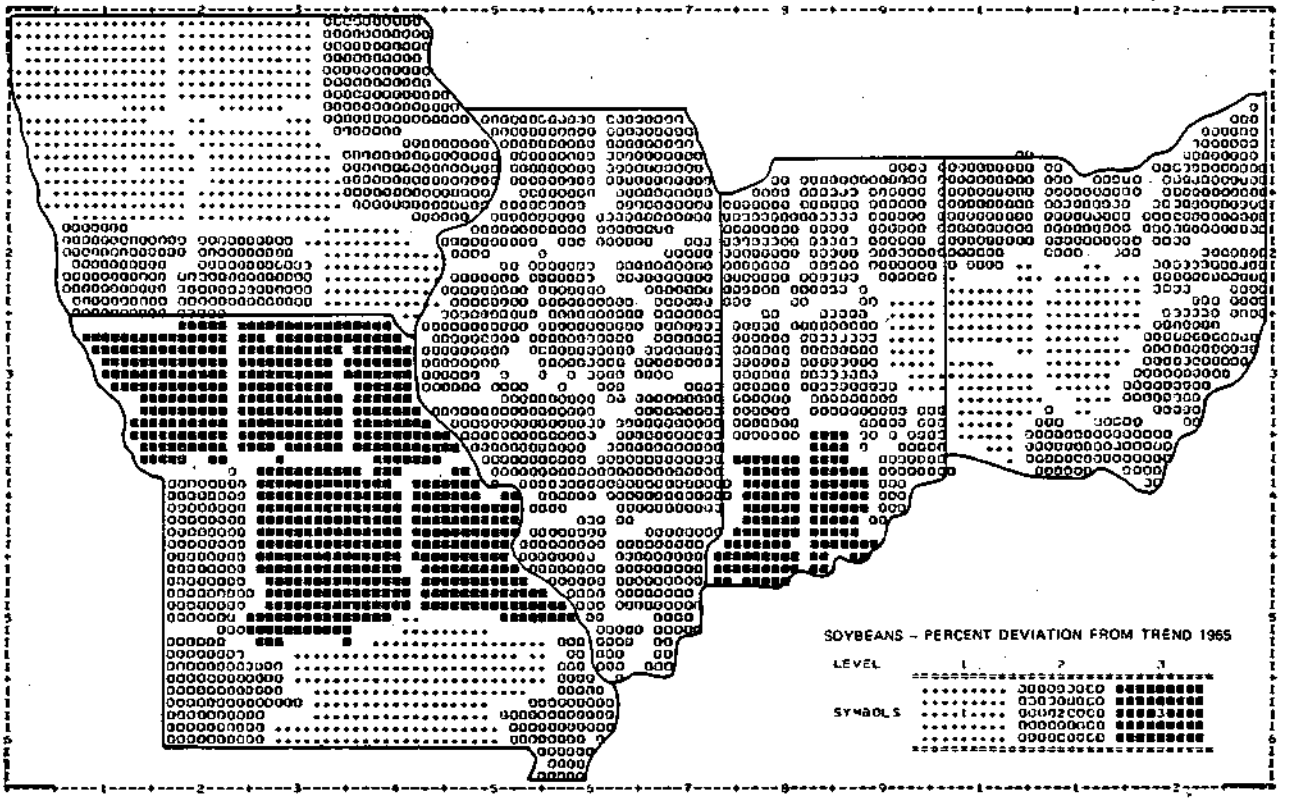
SYMBOLS


SOYBEANS – PERCENT DEVIATION FROM TREND 1965
LEVEL
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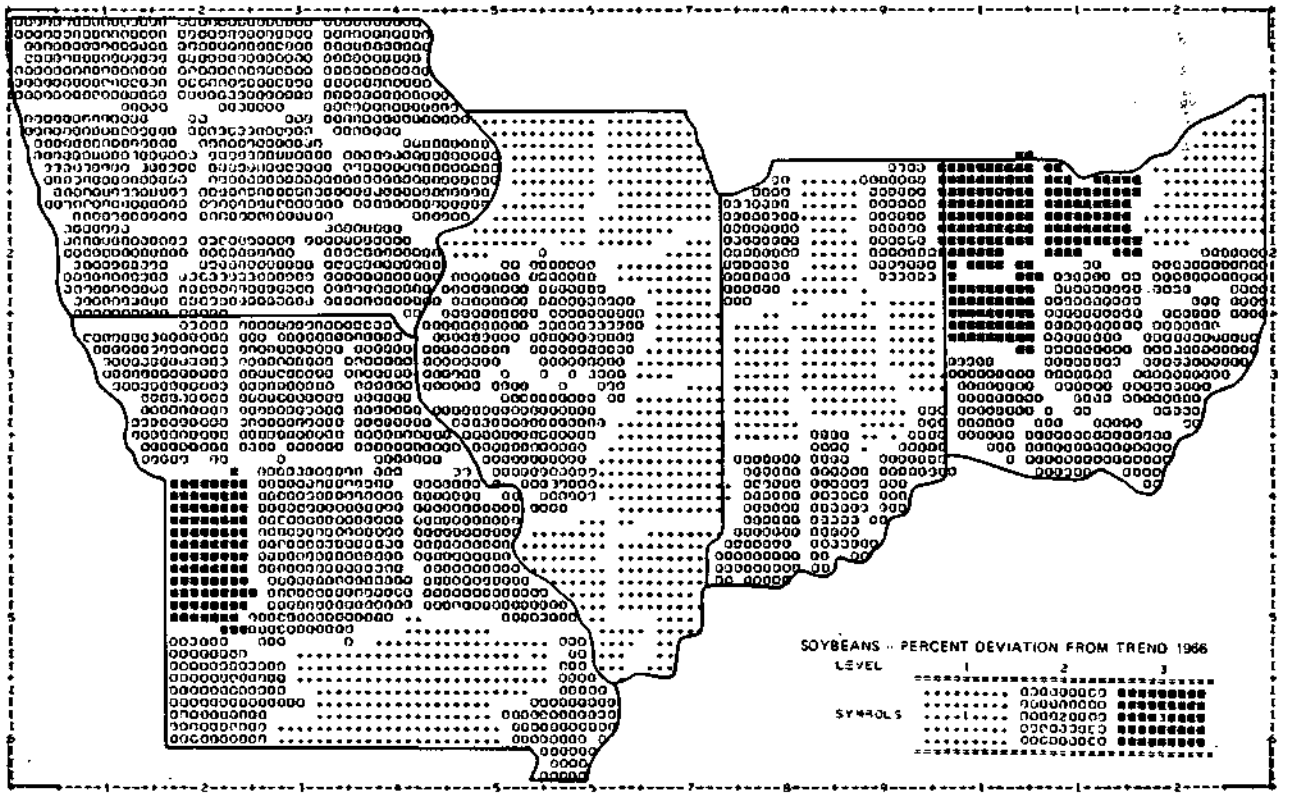
SYMBOLS


SOYBEANS – PERCENT DEVIATION FROM TREND 1966
LEVEL
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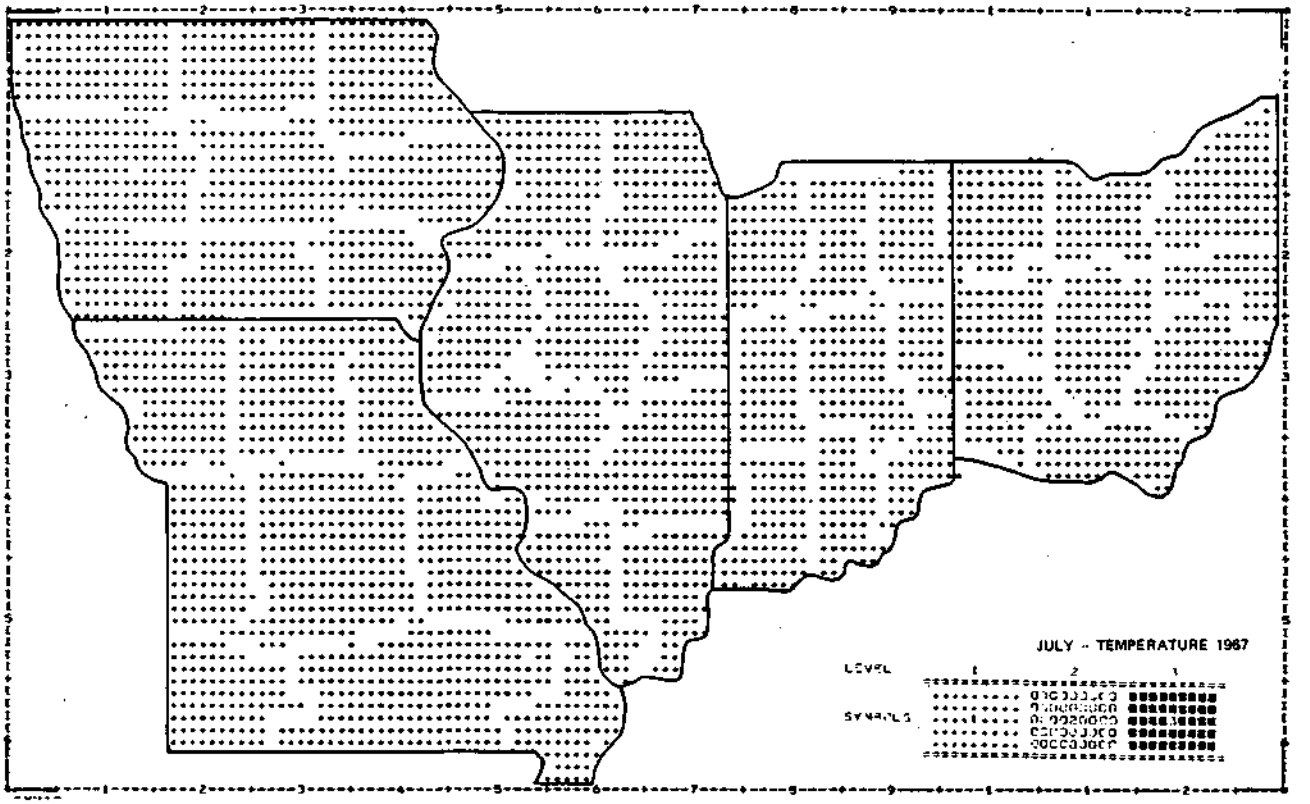
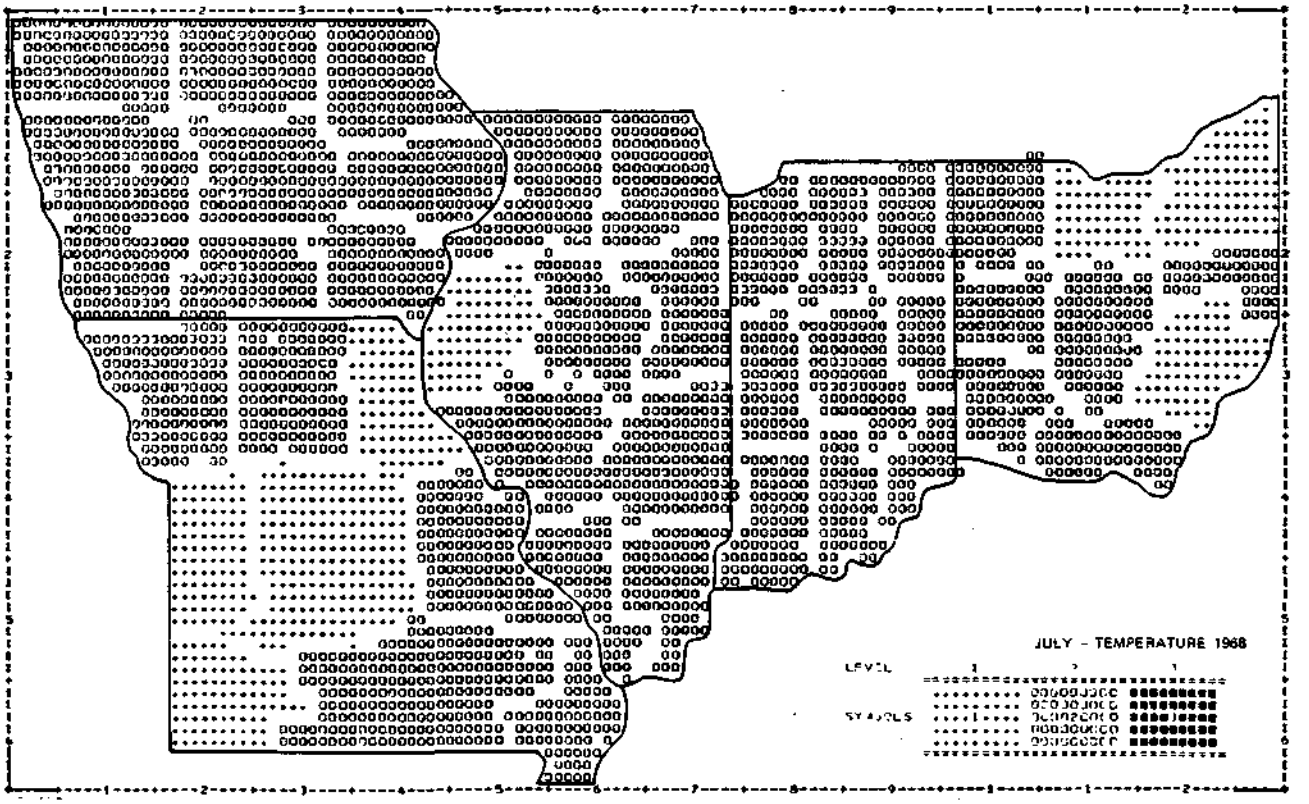
SYMBOLS


JULY - TEMPERATURE 1967
LEVEL
SYMBOLS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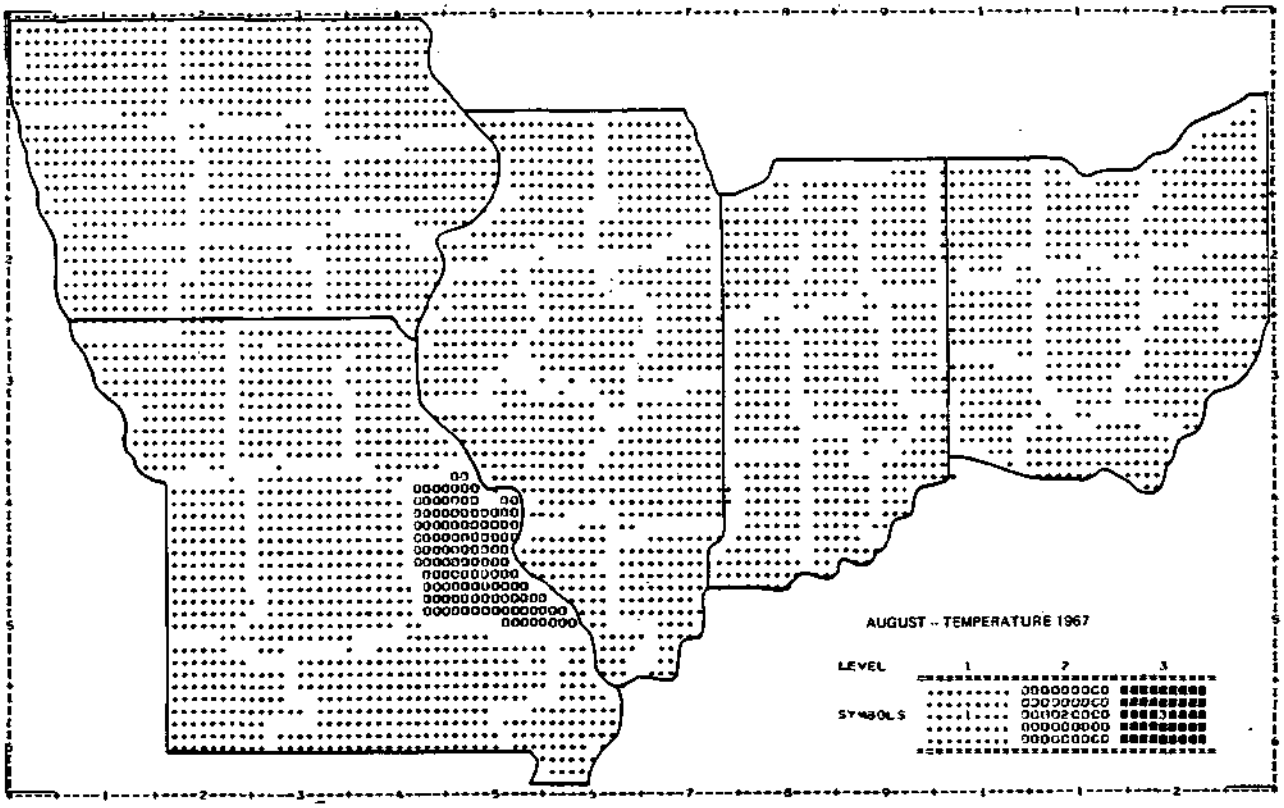
LEVEL
SYMBOLS


AUGUST -- TEMPERATURE 1967
LEVEL
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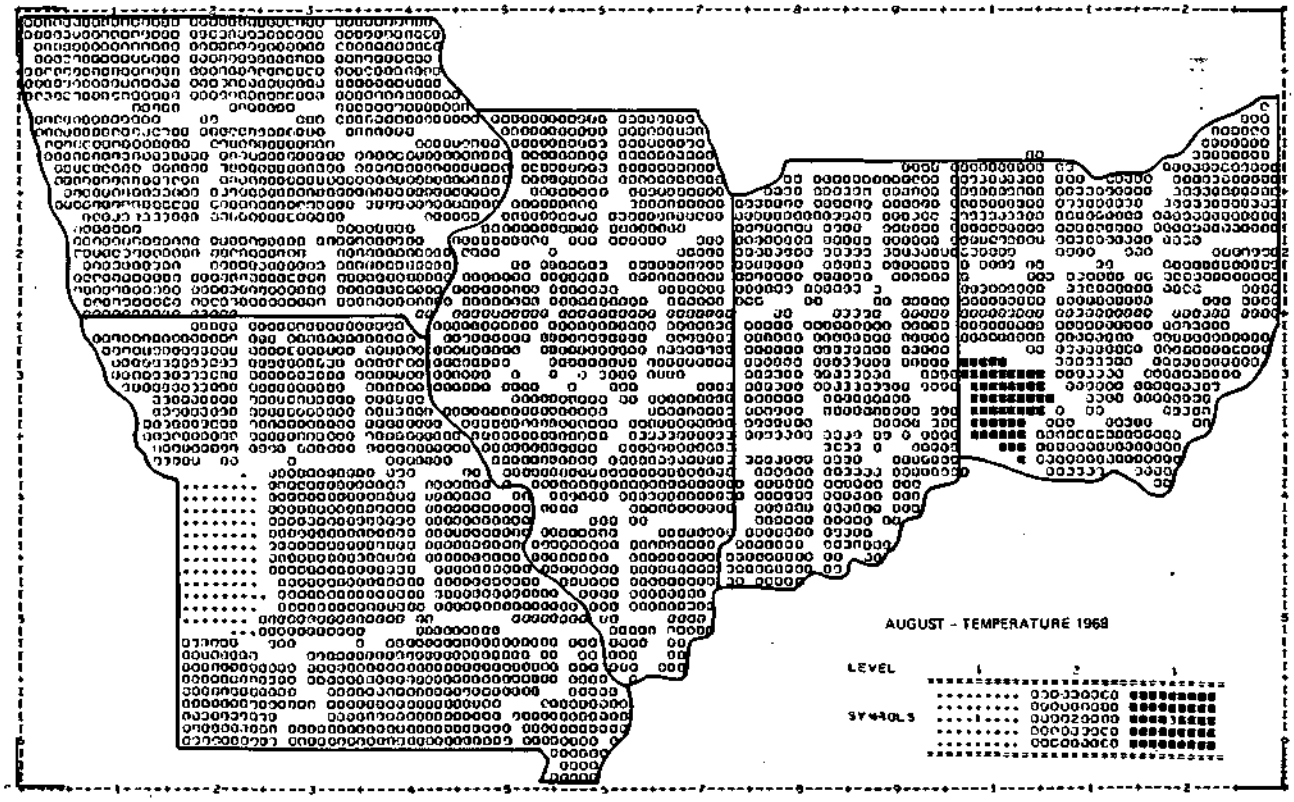
SYMBOLS


AUGUST -- TEMPERATURE 1968
LEVEL
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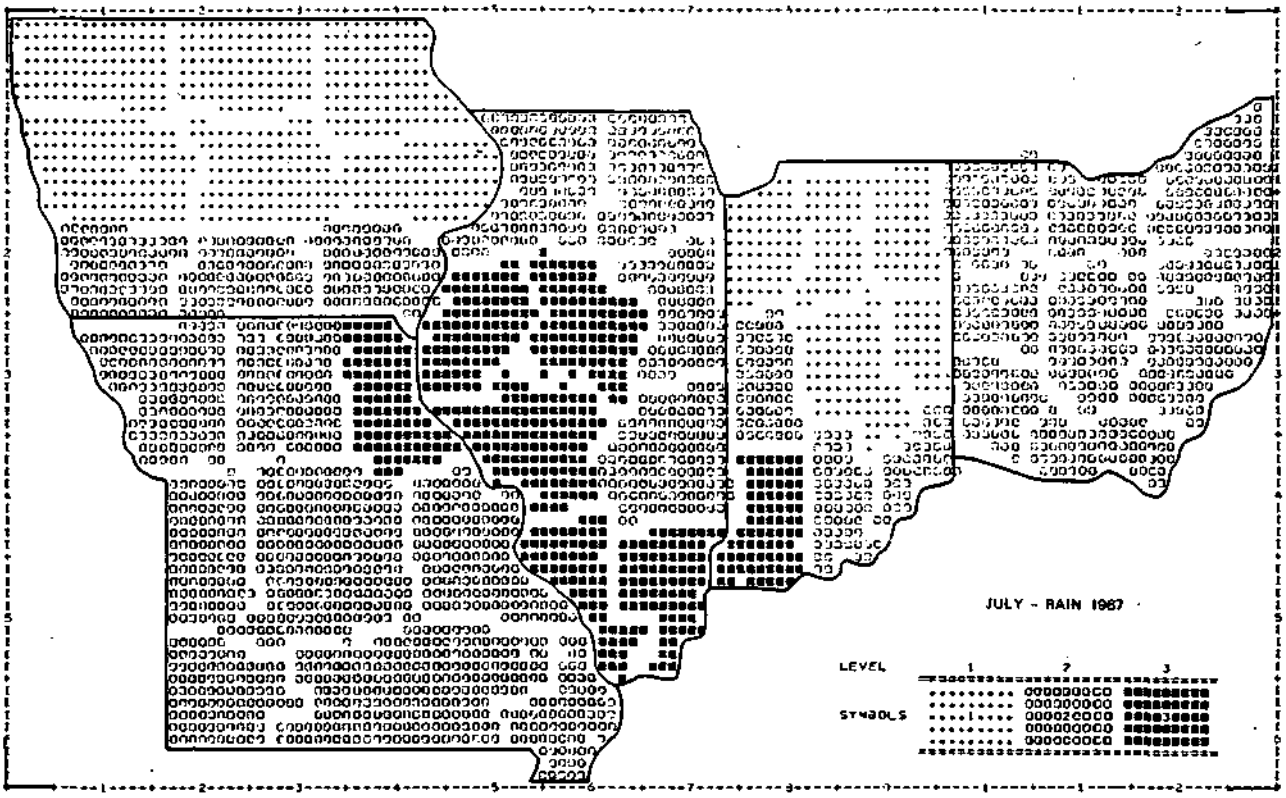
SYMBOLS


JULY - RAIN 1967
LEVEL
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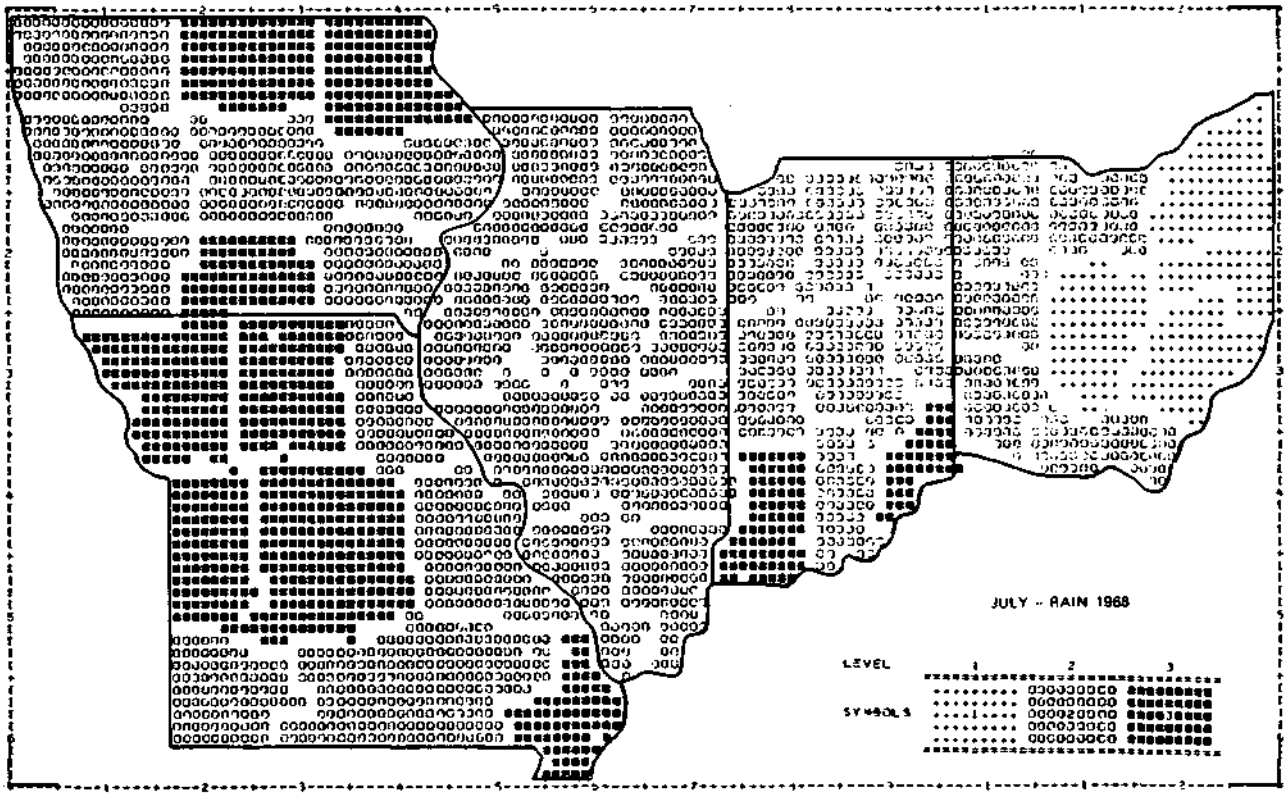
SYMBOLS


JULY - RAIN 1968
LEVEL
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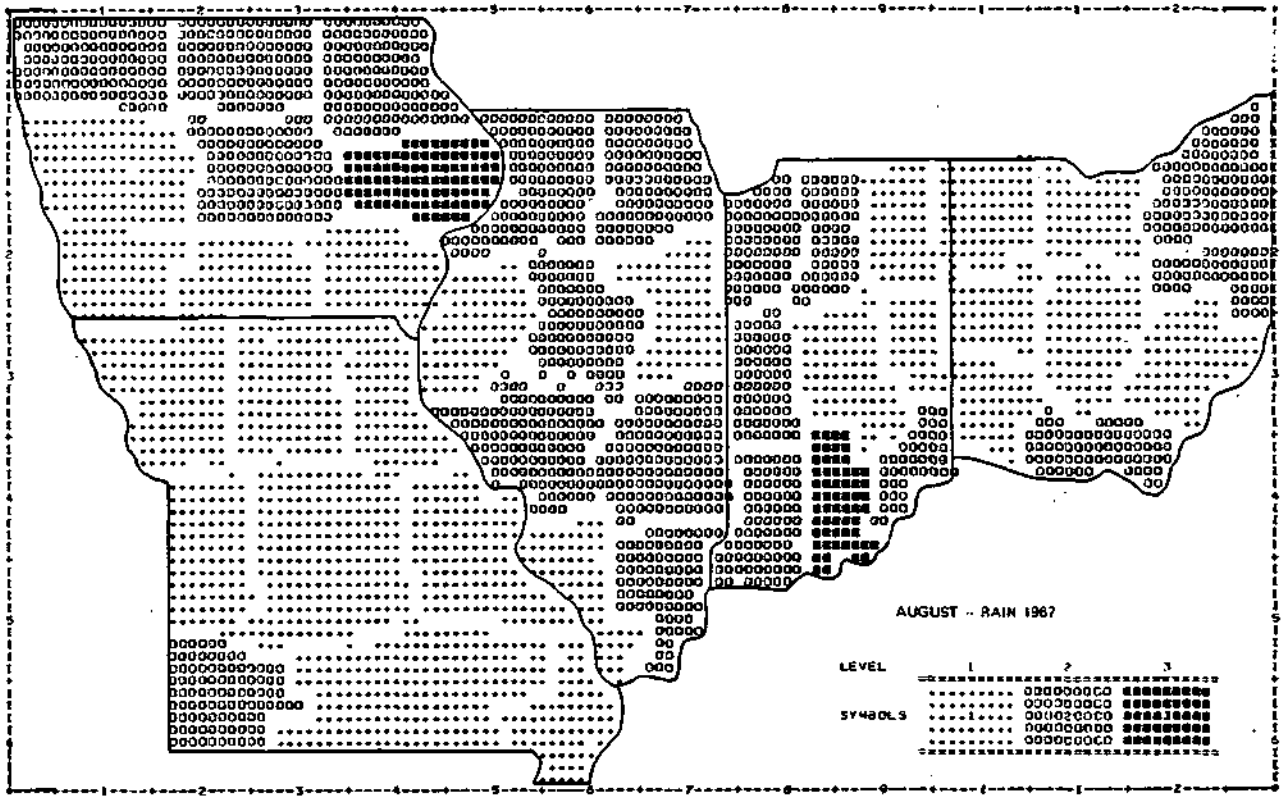
SYMBOLS


AUGUST -- RAIN 1967
LEVEL
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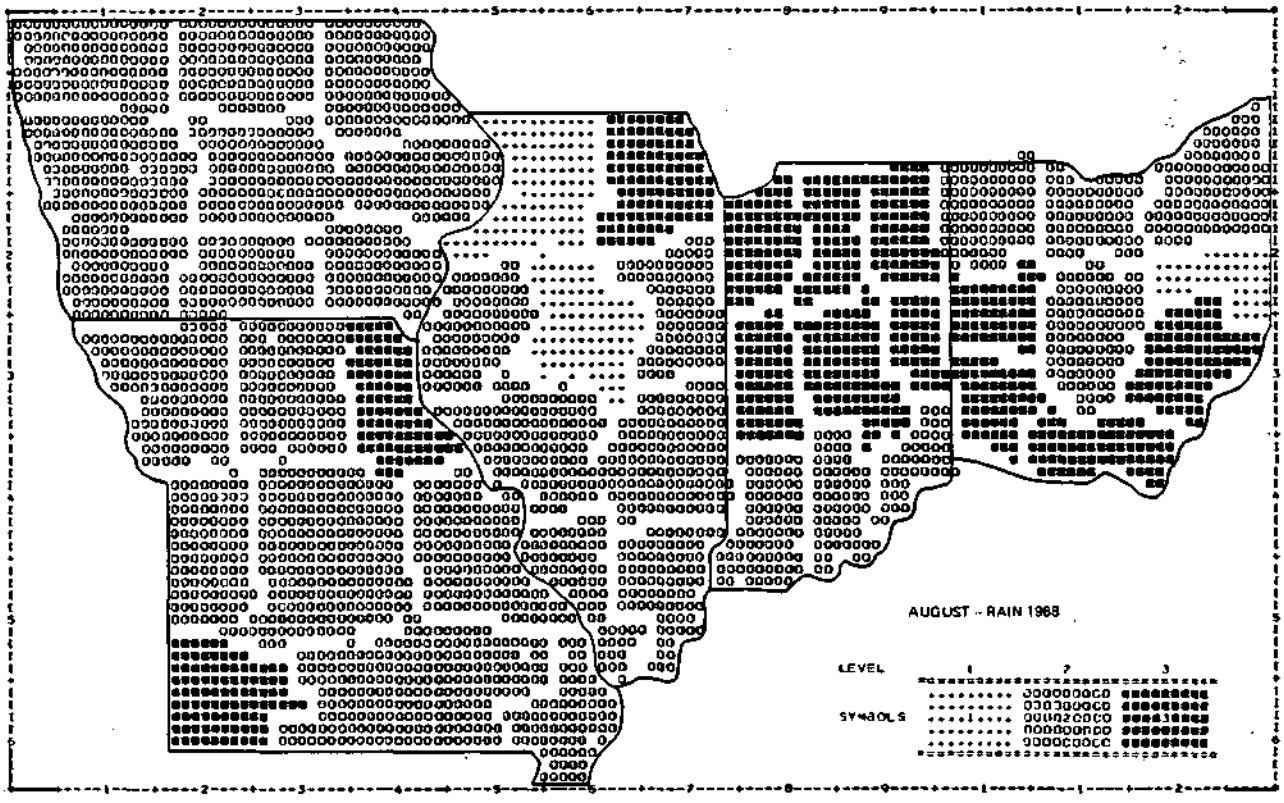
SYMBOLS


AUGUST -- RAIN 1968
LEVEL
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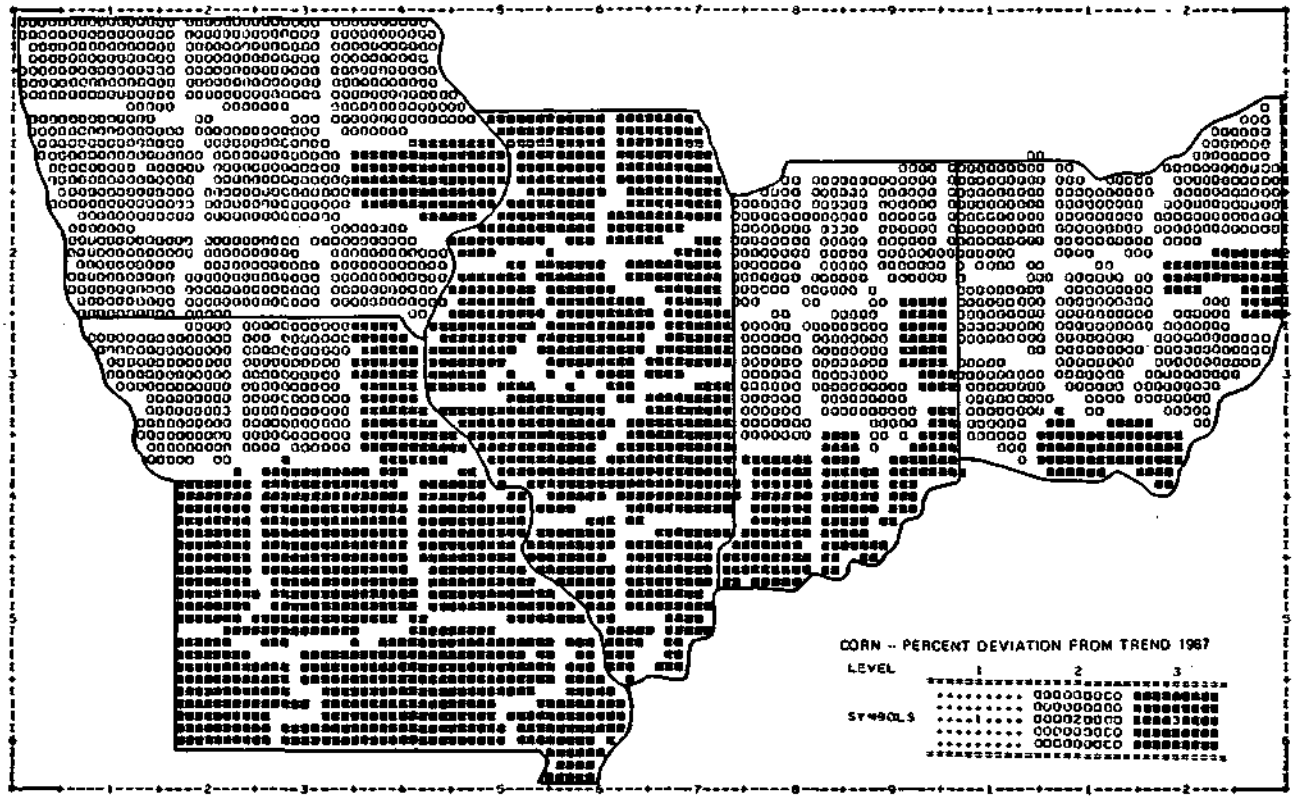
SYMBOLS


CORN -- PERCENT DEVIATION FROM TREND 1967
LEVEL
1
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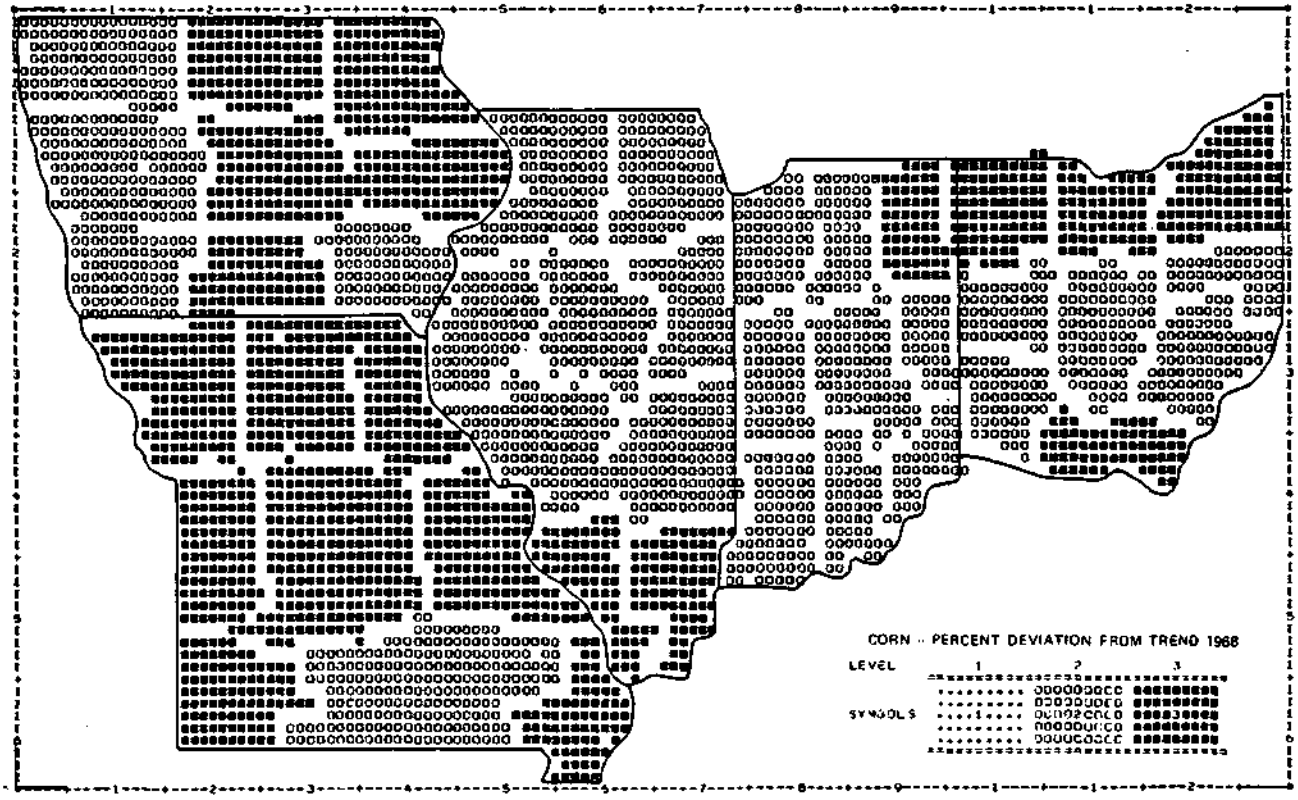
SYMBOLS


CORN -- PERCENT DEVIATION FROM TREND 1968
LEVEL
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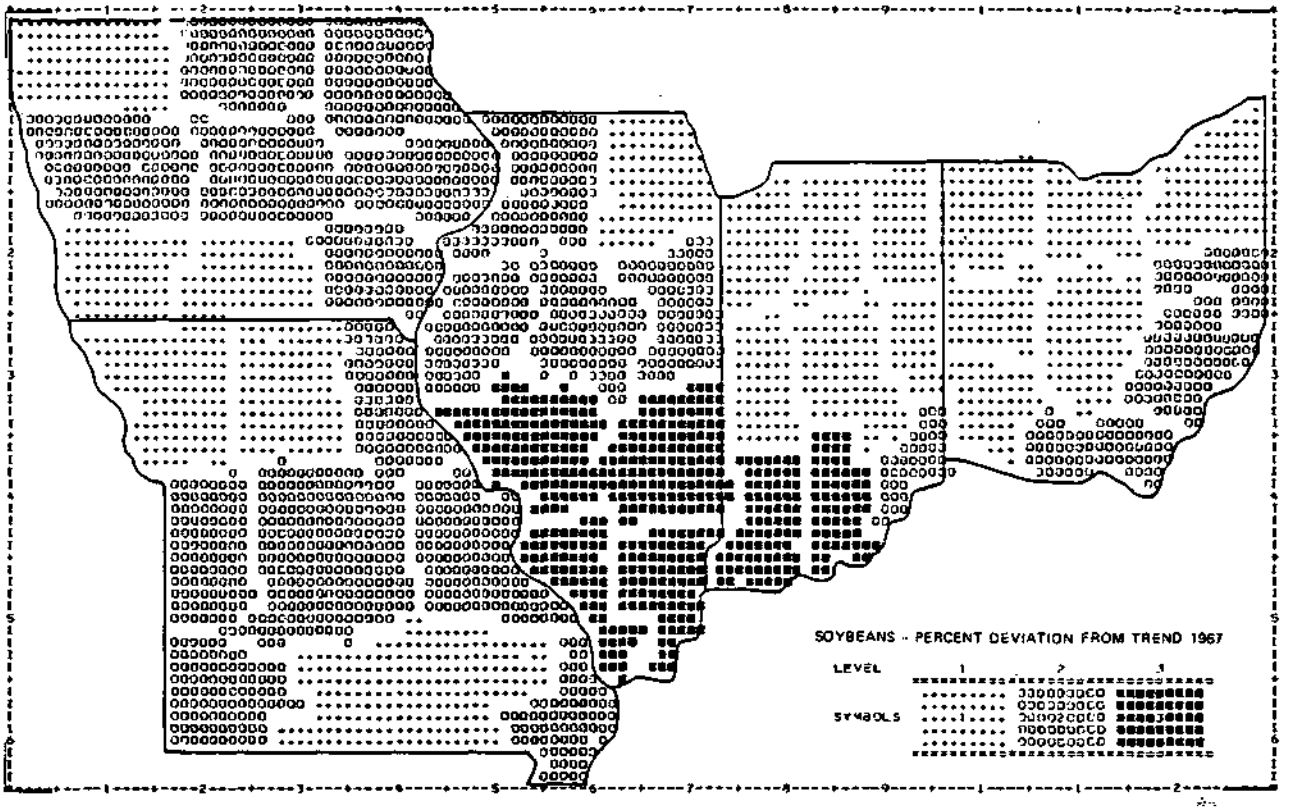
SYMBOLS


SOYBEANS - PERCENT DEVIATION FROM TREND 1967
LEVEL
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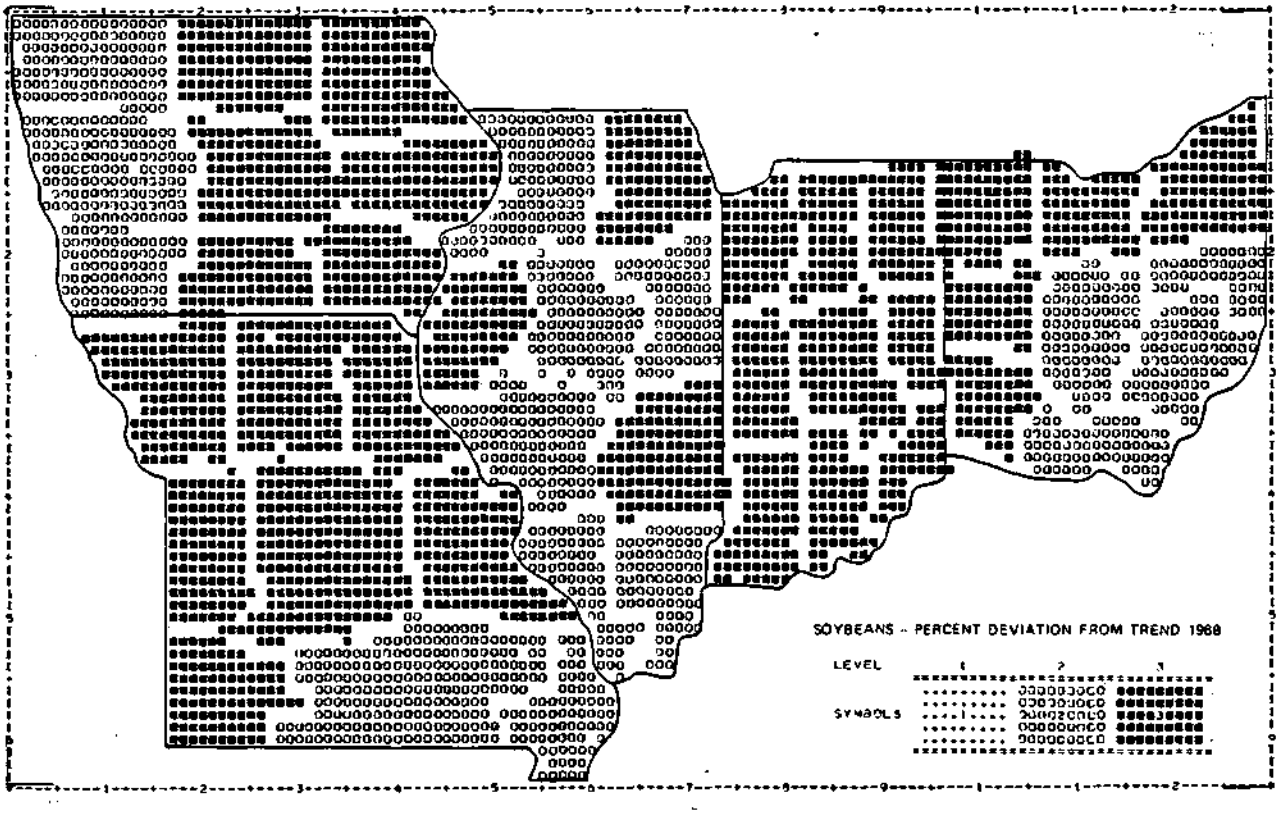
SYMBOLS


SOYBEANS - PERCENT DEVIATION FROM TREND 1968
LEVEL
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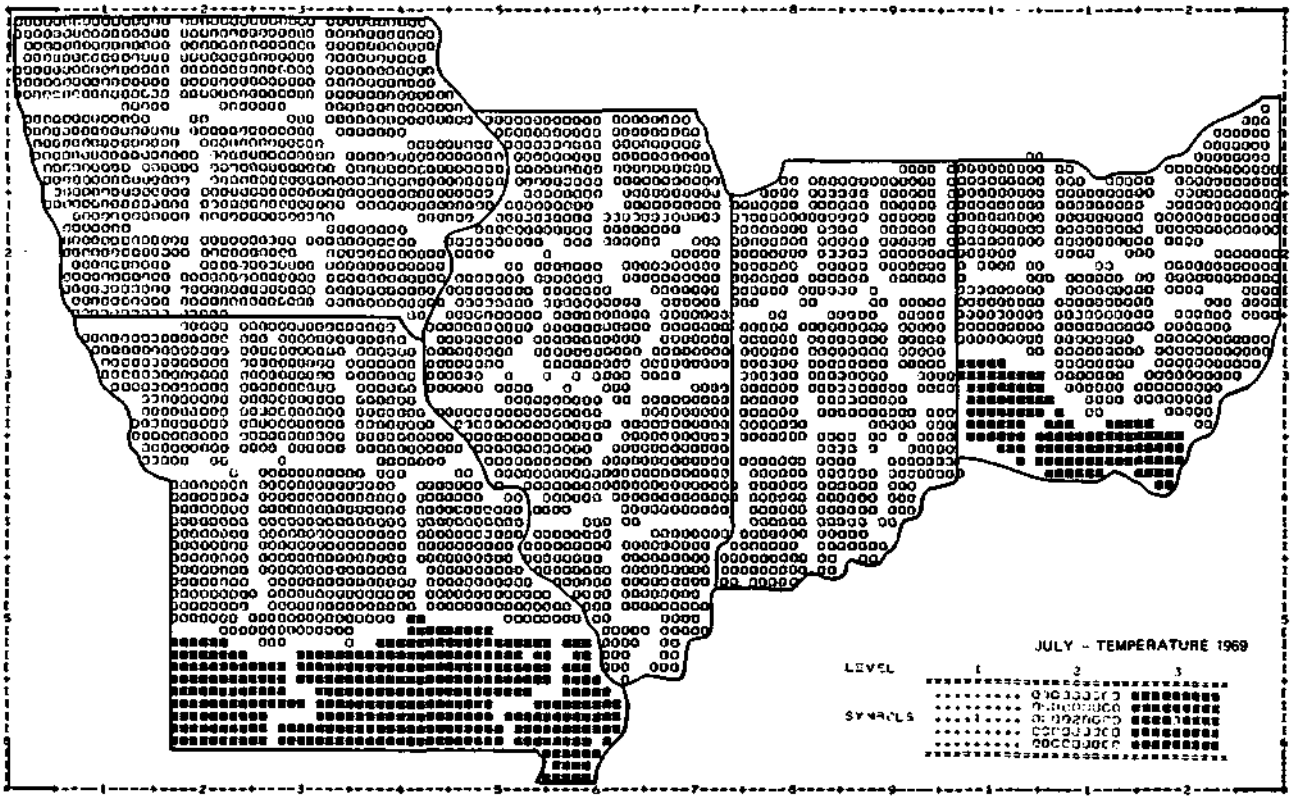
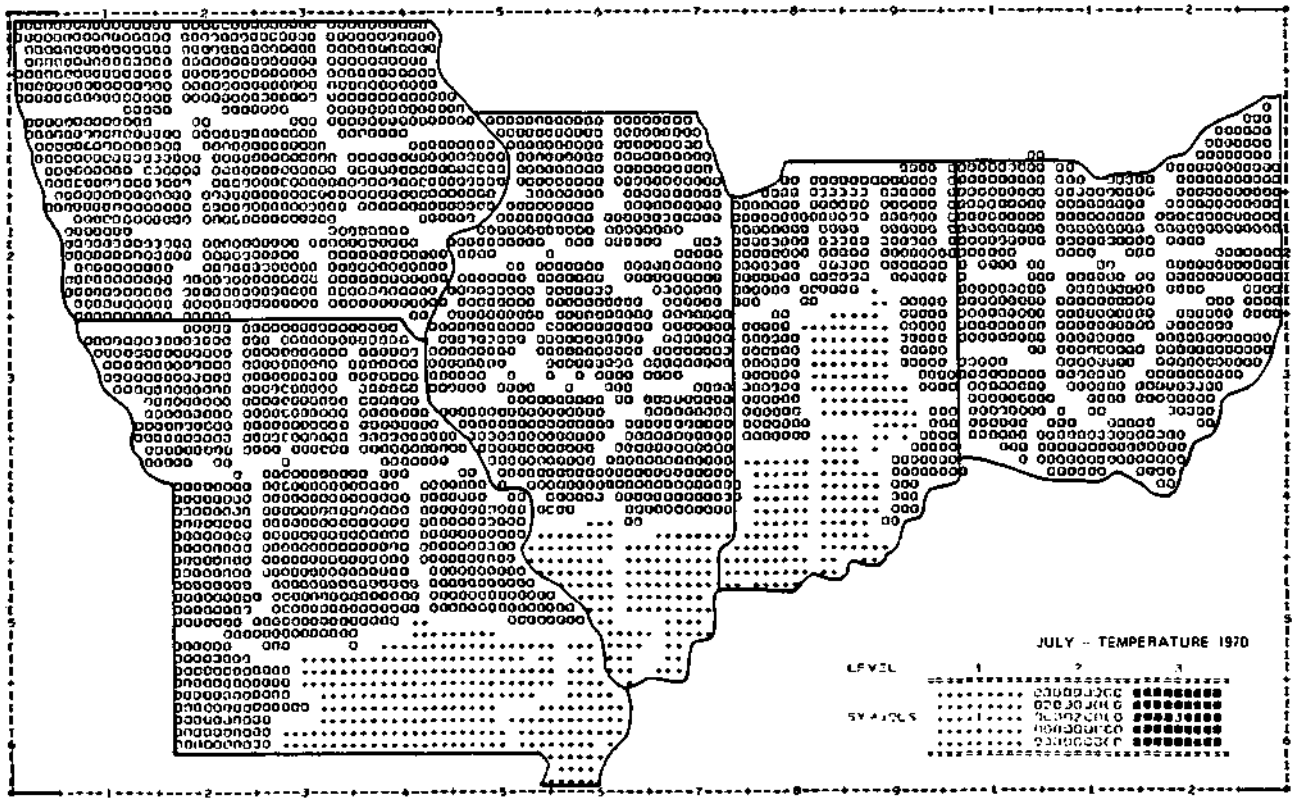
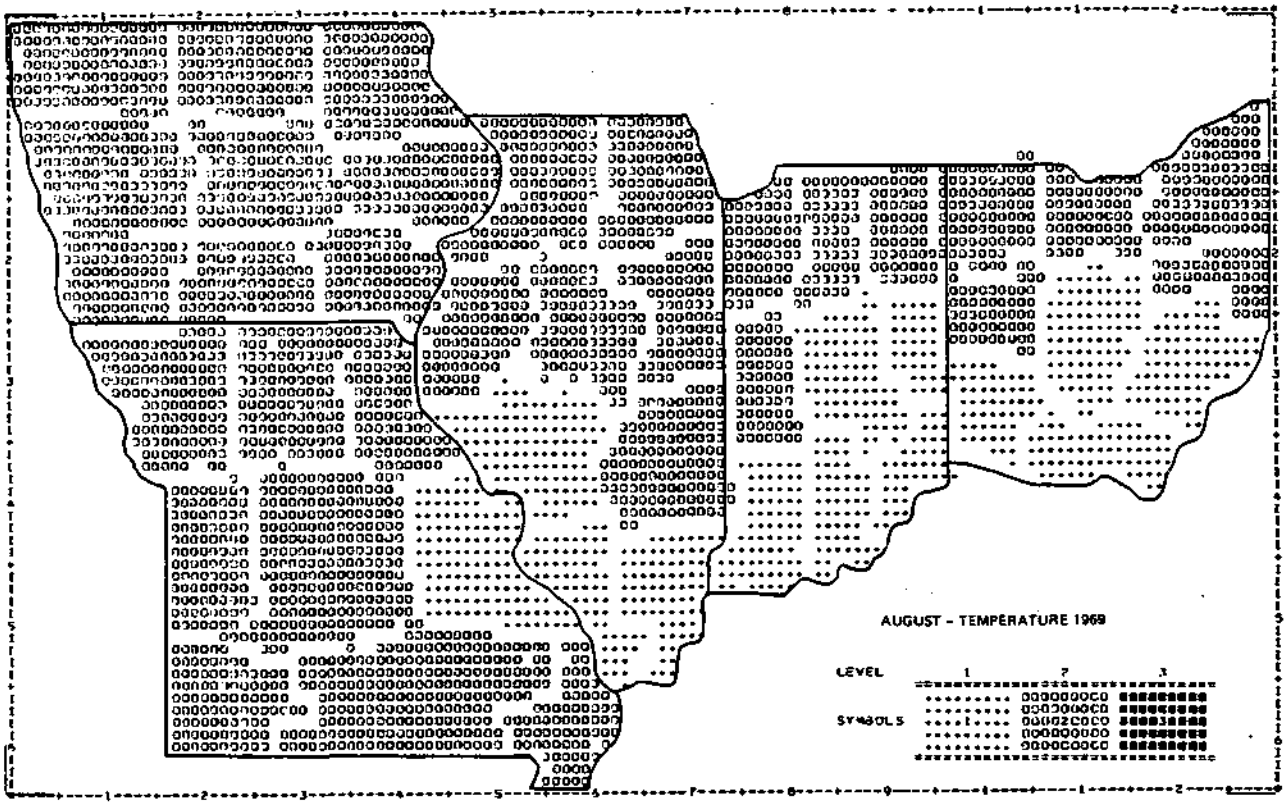
SYMBOLS


JULY - TEMPERATURE 1969
LEVEL
SYMBOLS


JULY - TEMPERATURE 1970
LEVEL
SYMBOLS


AUGUST – TEMPERATURE 1969
LEVEL
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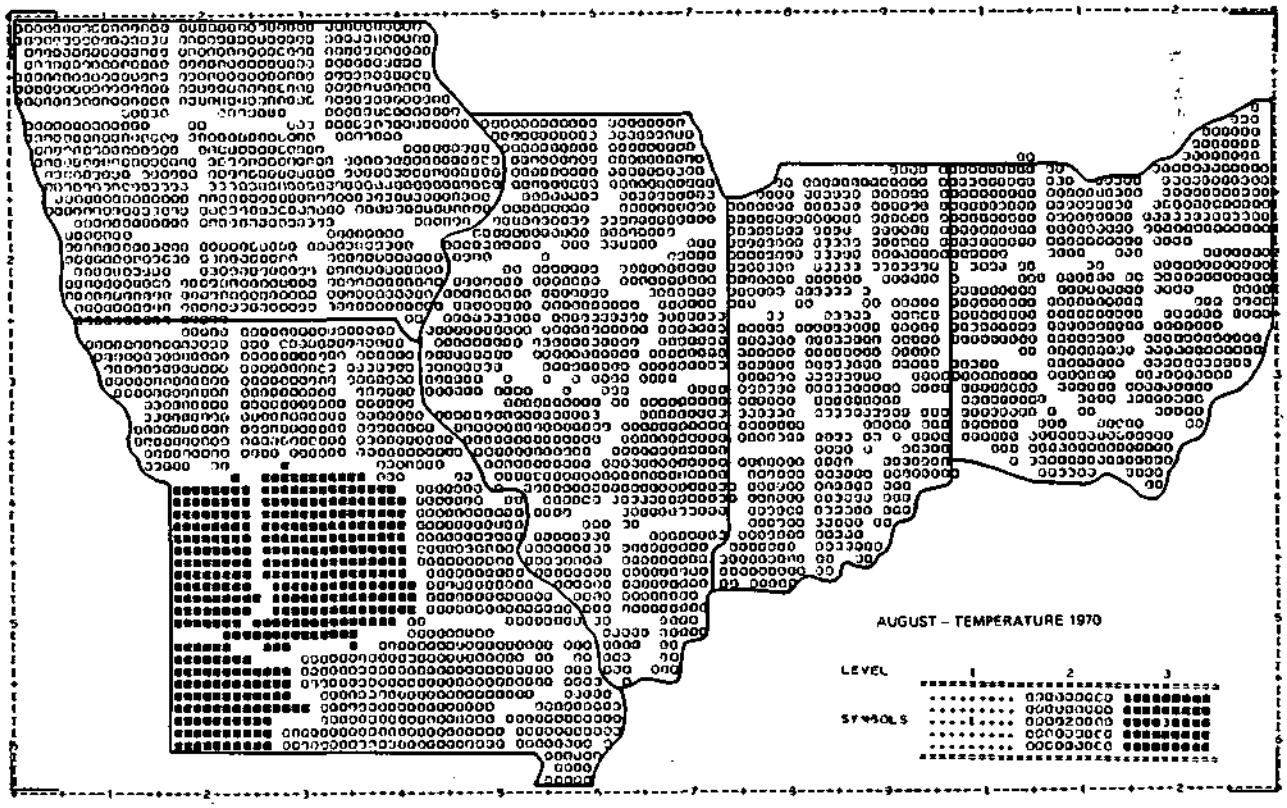
SYMBOLS


AUGUST – TEMPERATURE 1970
LEVEL
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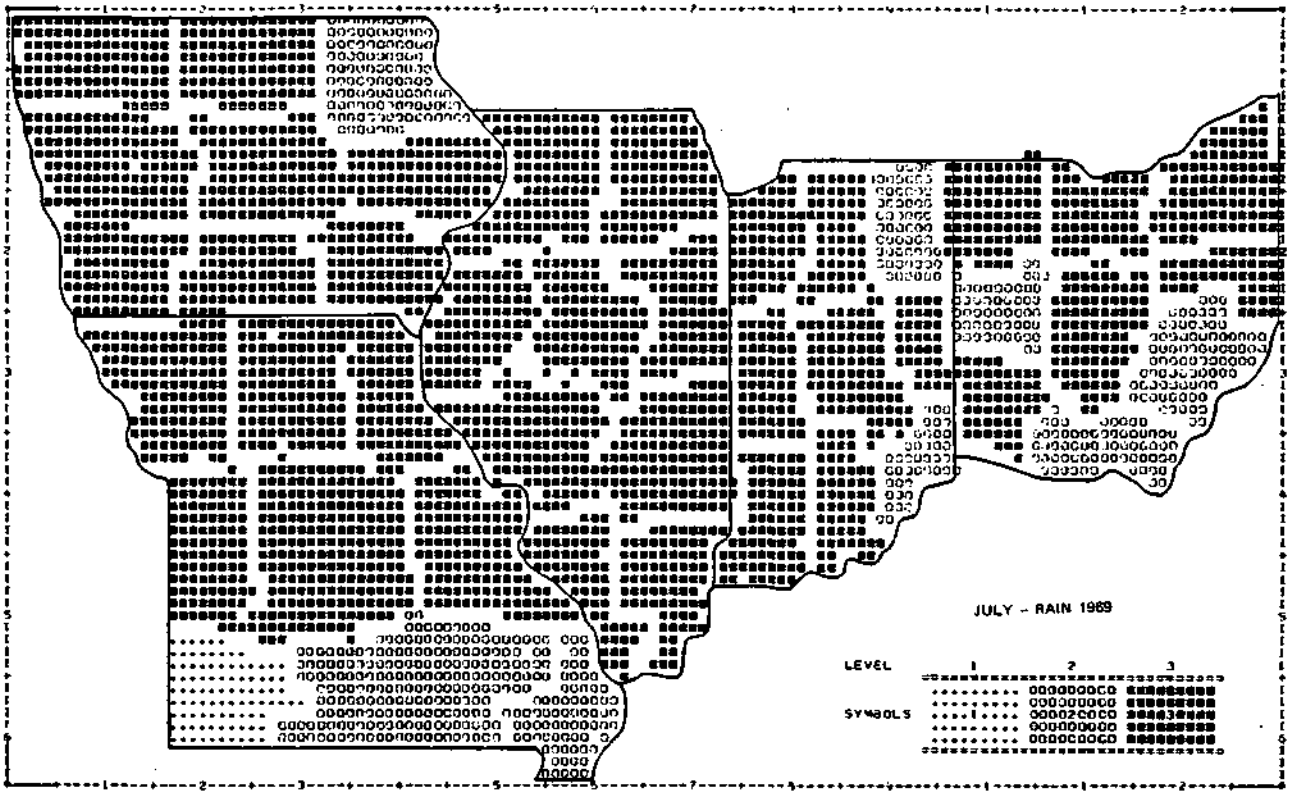
SYMBOLS


JULY - RAIN 1969
LEVEL
1
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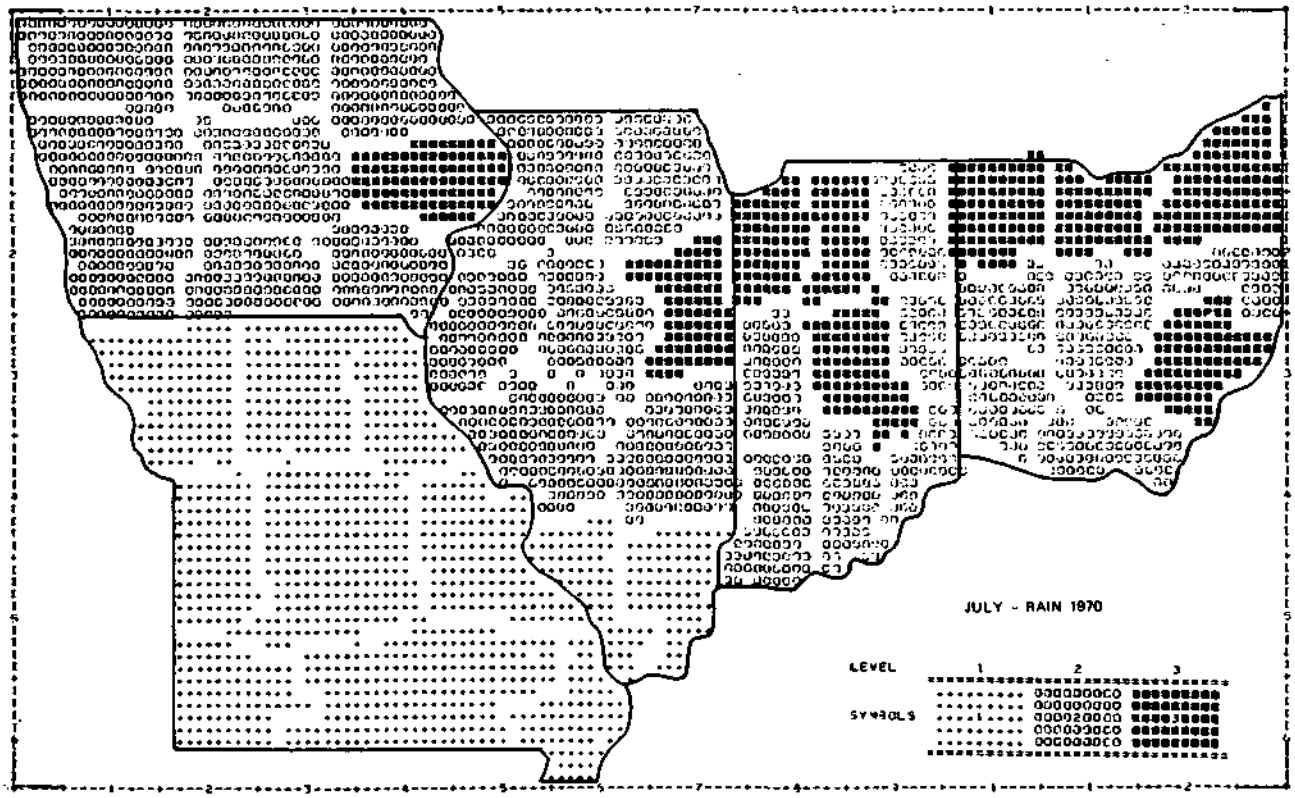
SYMBOLS


JULY - RAIN 1970
LEVEL
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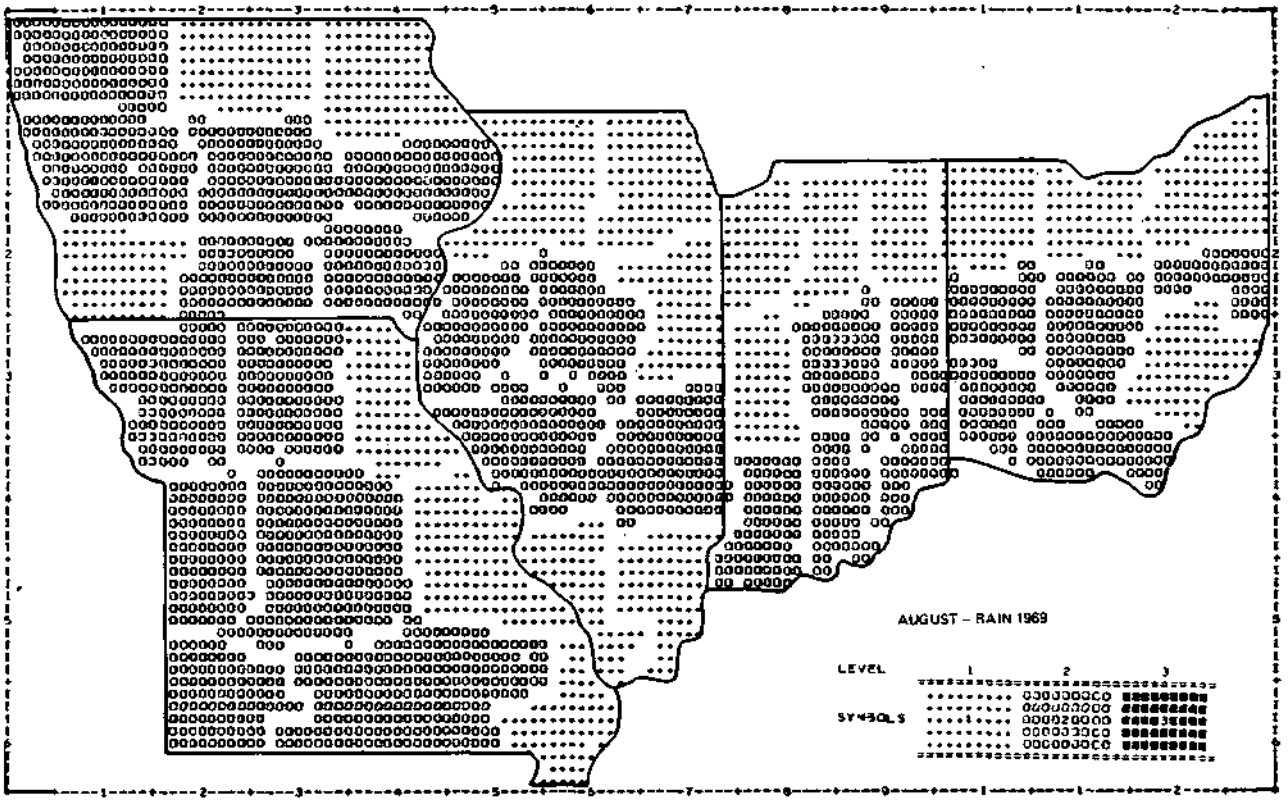
SYMBOLS


AUGUST – RAIN 1969
LEVEL
1
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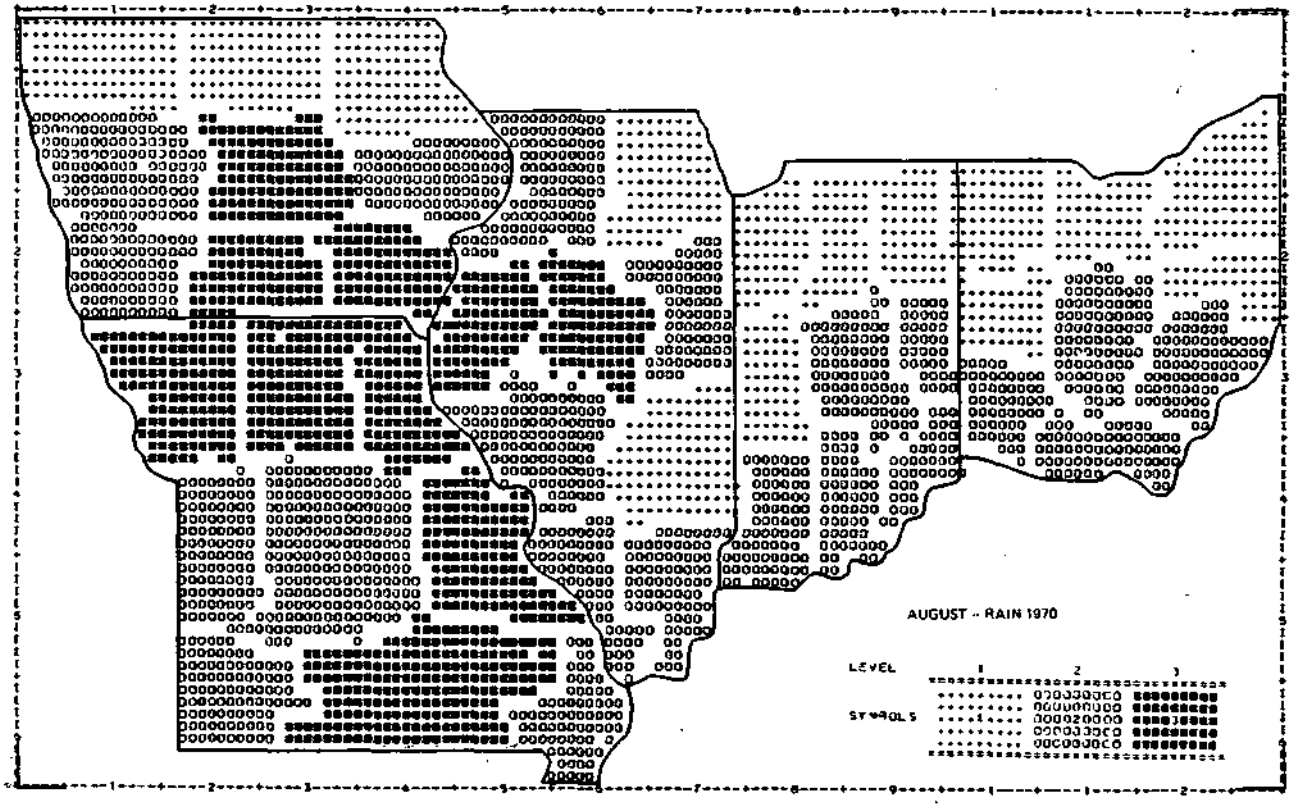
SYMBOLS


AUGUST – RAIN 1970
LEVEL
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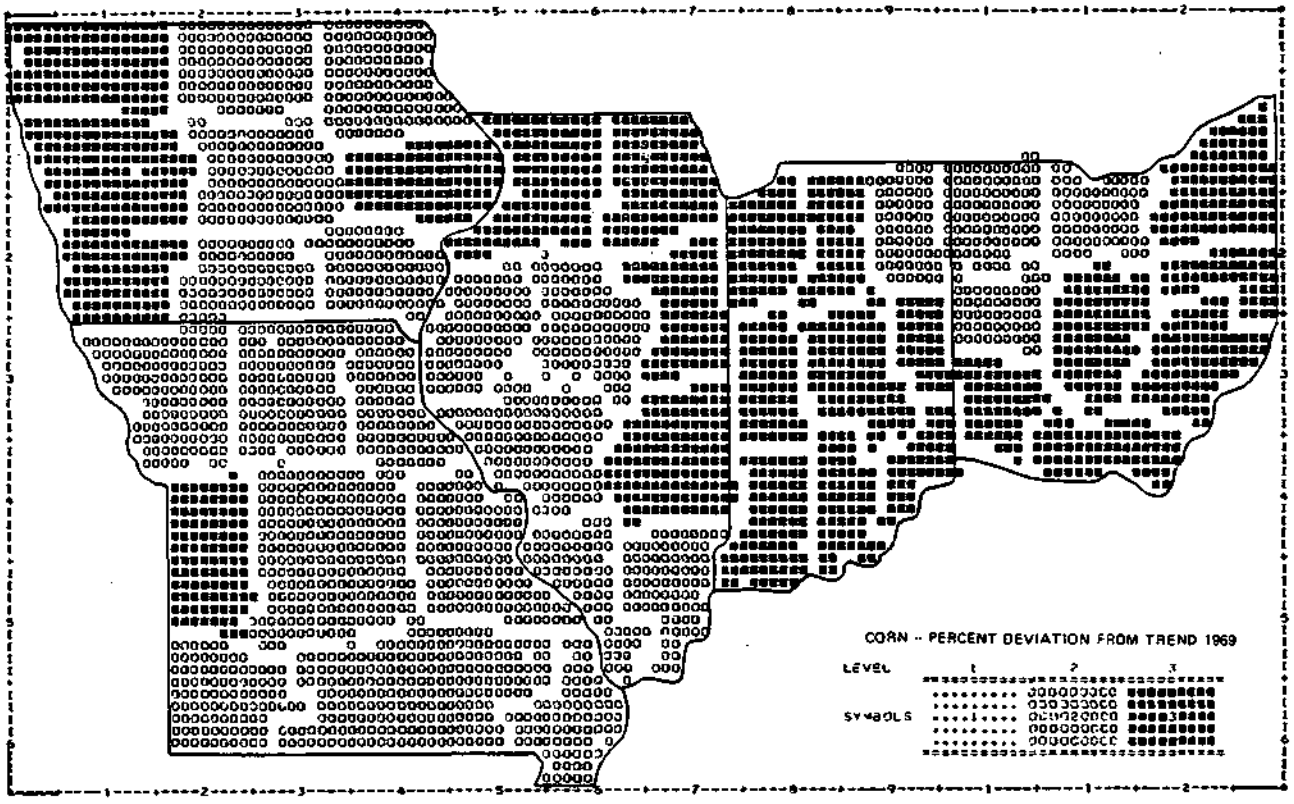
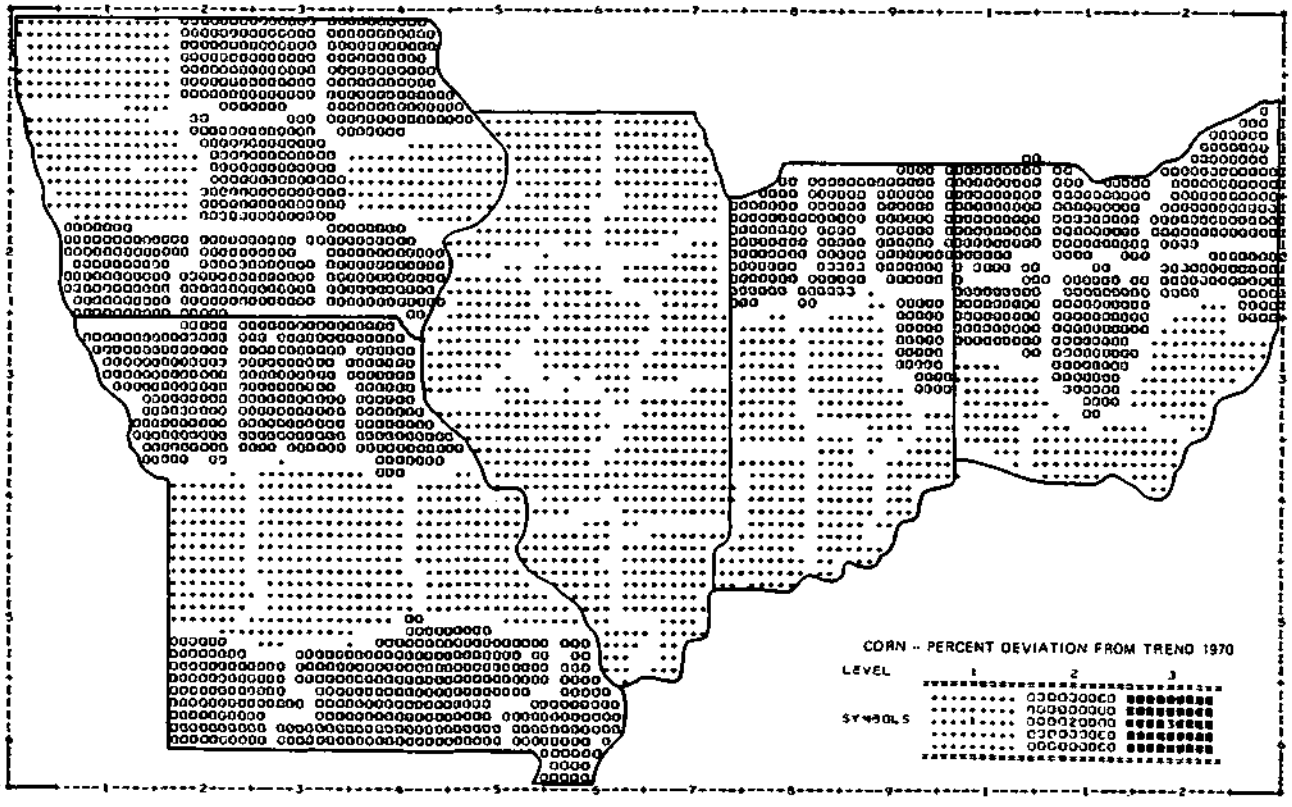
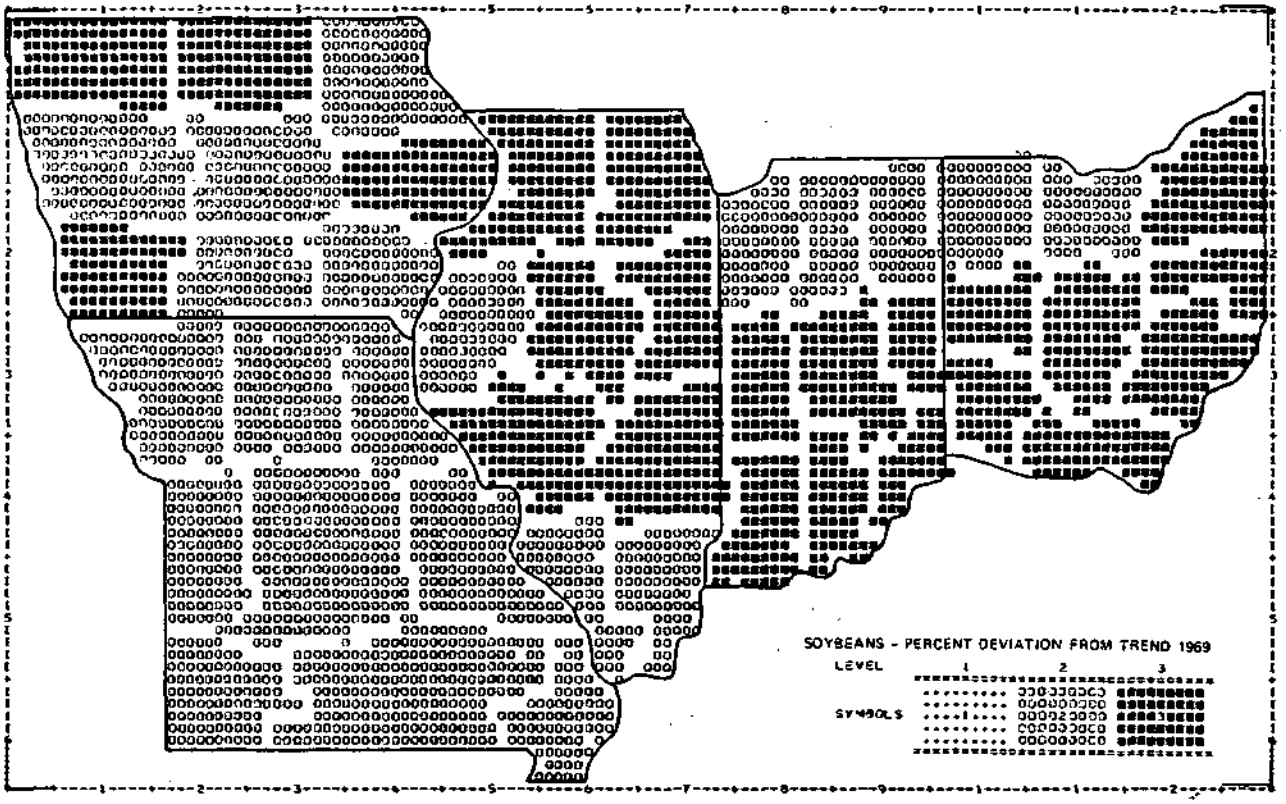
SYMBOLS


CORN -- PERCENT DEVIATION FROM TREND 1969
LEVEL
SYMBOLS


CORN -- PERCENT DEVIATION FROM TREND 1970
LEVEL
SYMBOLS


SOYBEANS - PERCENT DEVIATION FROM TREND 1969
LEVEL
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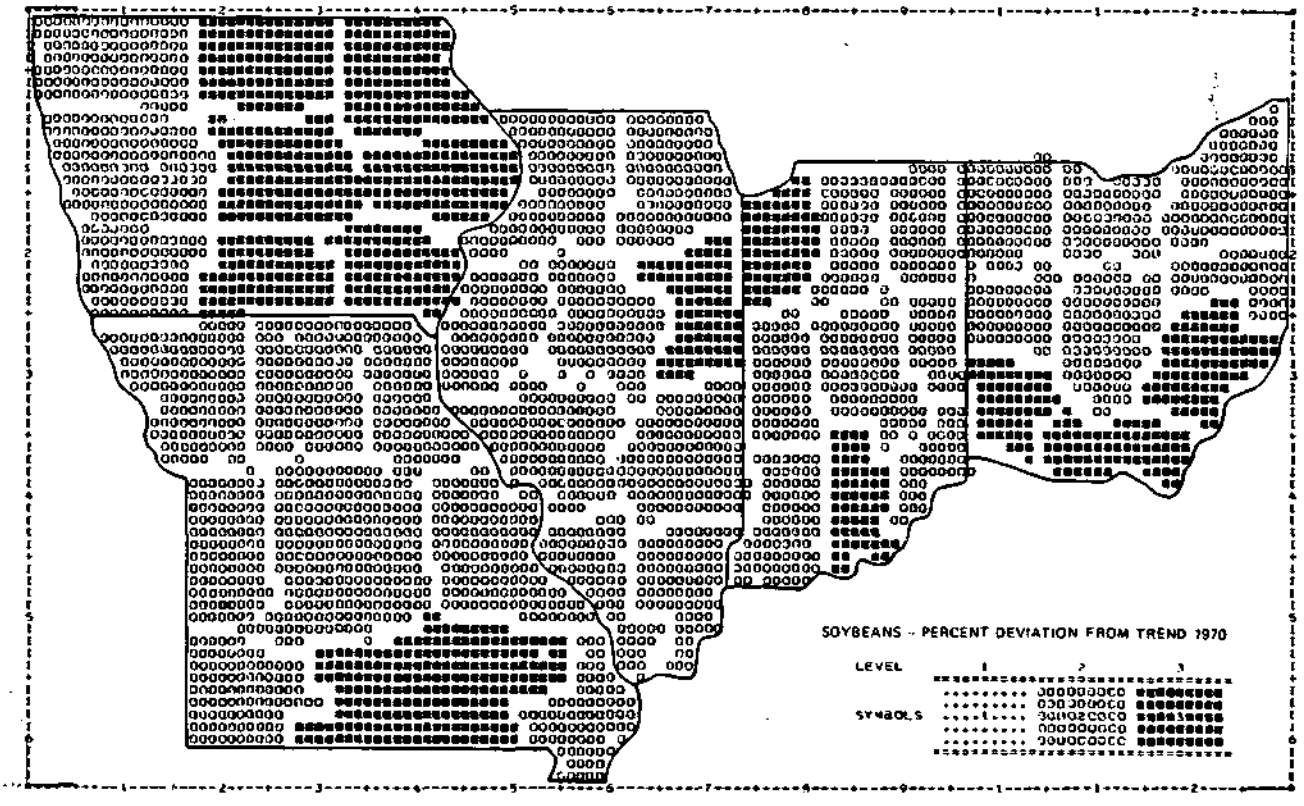
SYMBOLS


SOYBEANS - PERCENT DEVIATION FROM TREND 1970
LEVEL
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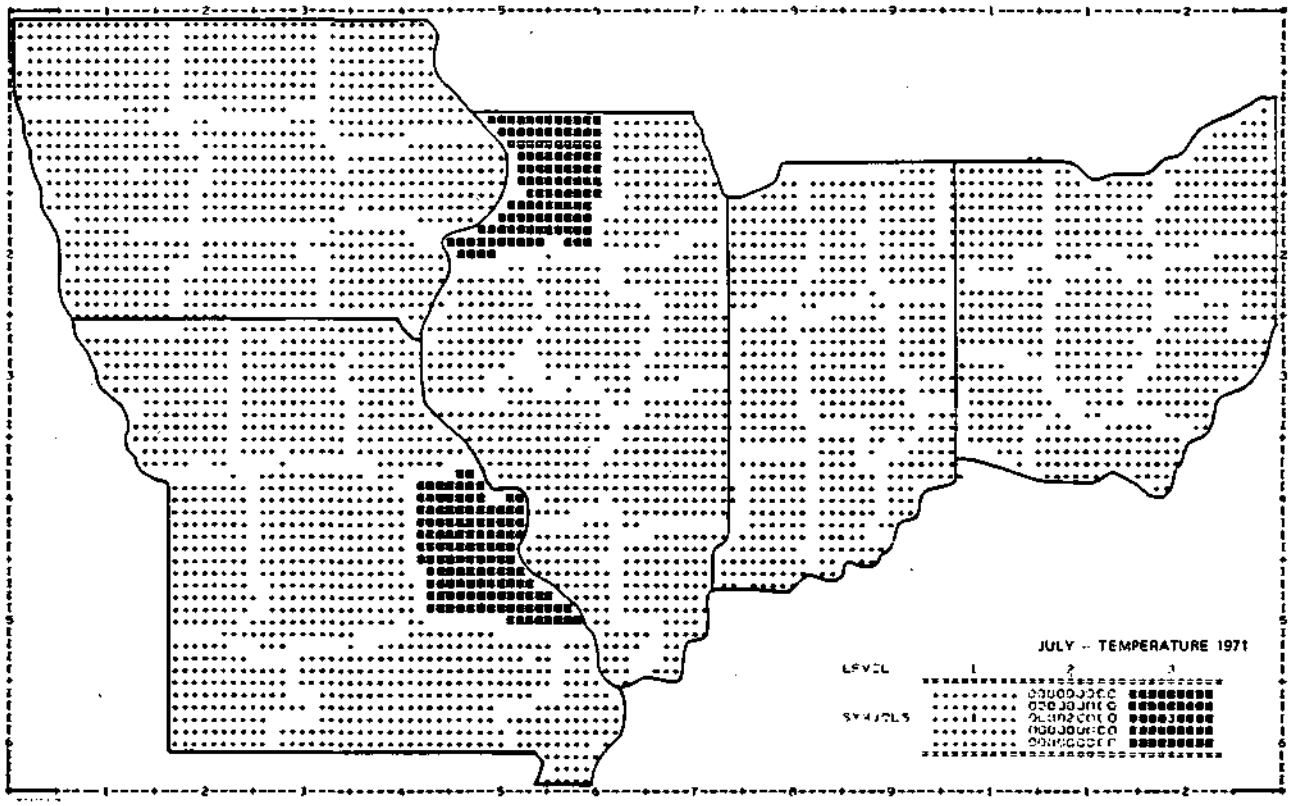
SYMBOLS


JULY -- TEMPERATURE 1971
LEVEL
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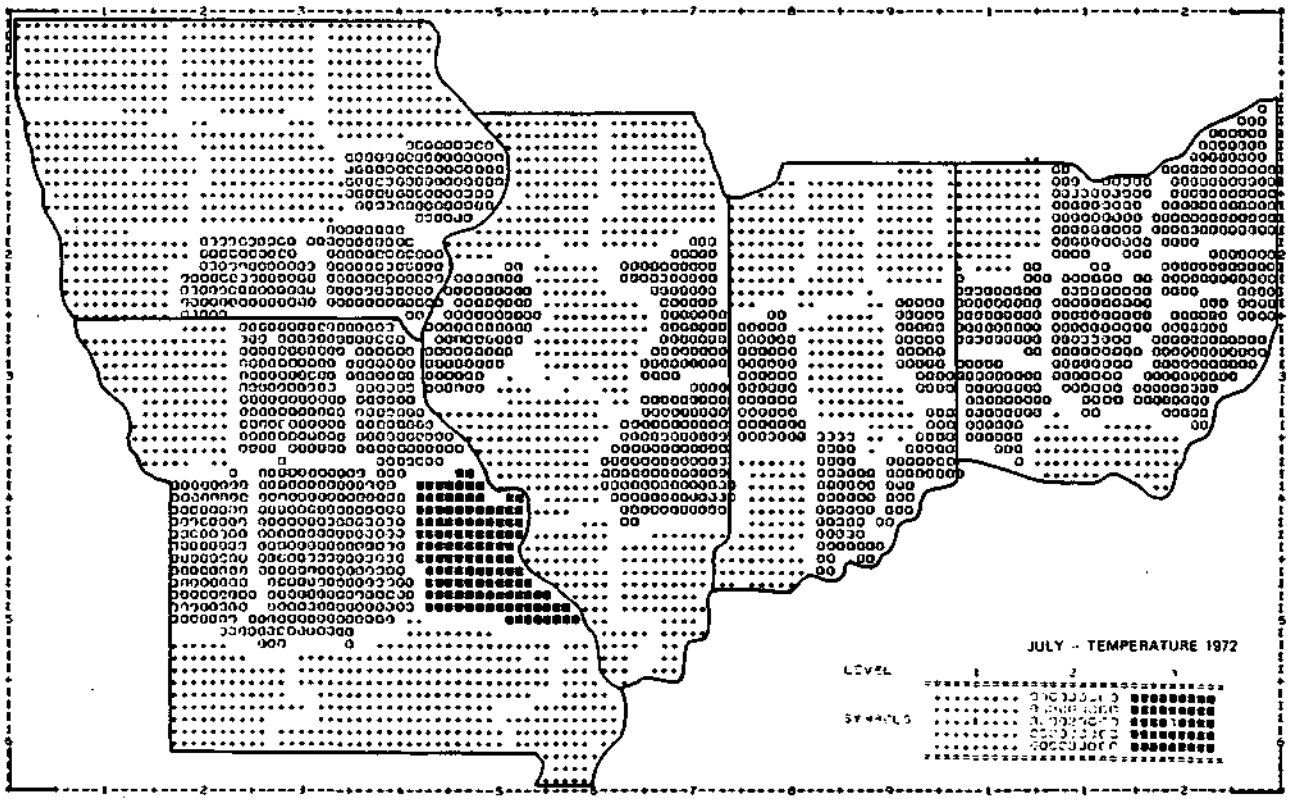
SYMBOLS


JULY -- TEMPERATURE 1972
LEVEL
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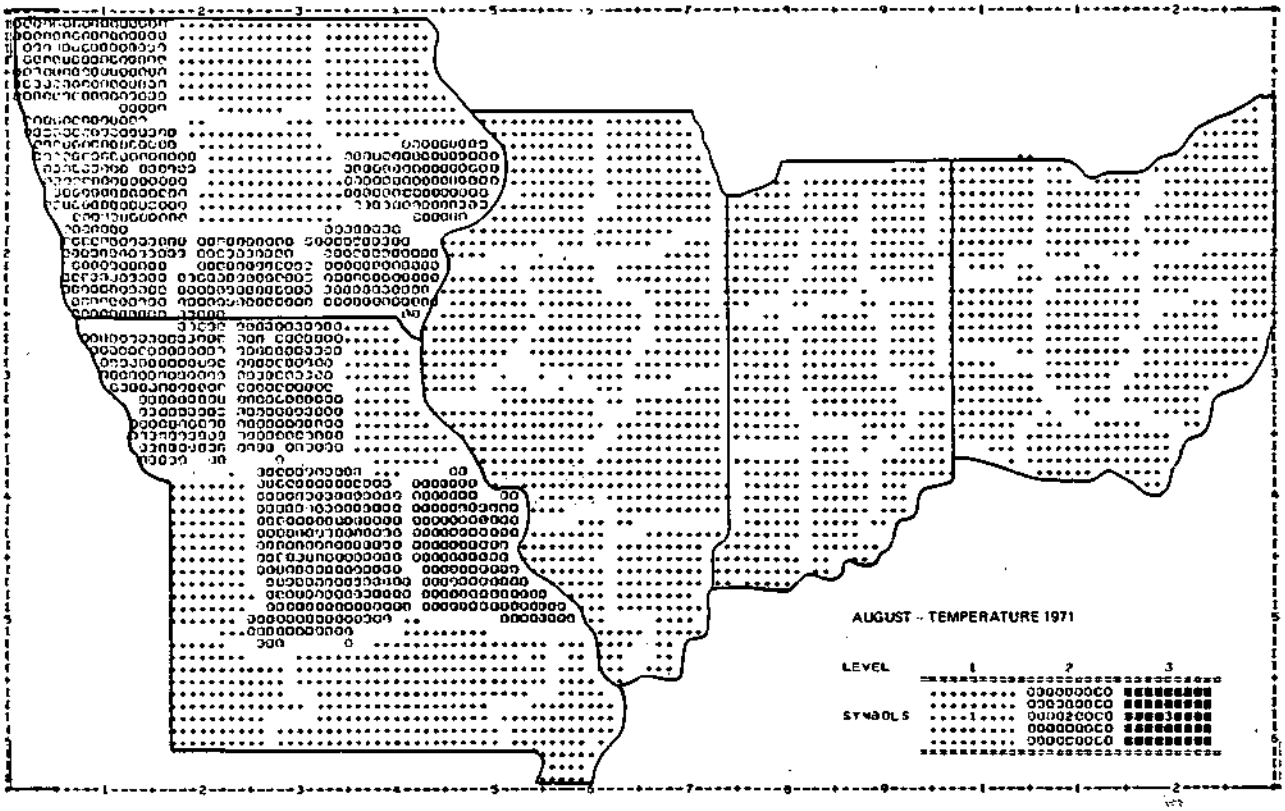
SYMBOLS


AUGUST -- TEMPERATURE 1971
LEVEL
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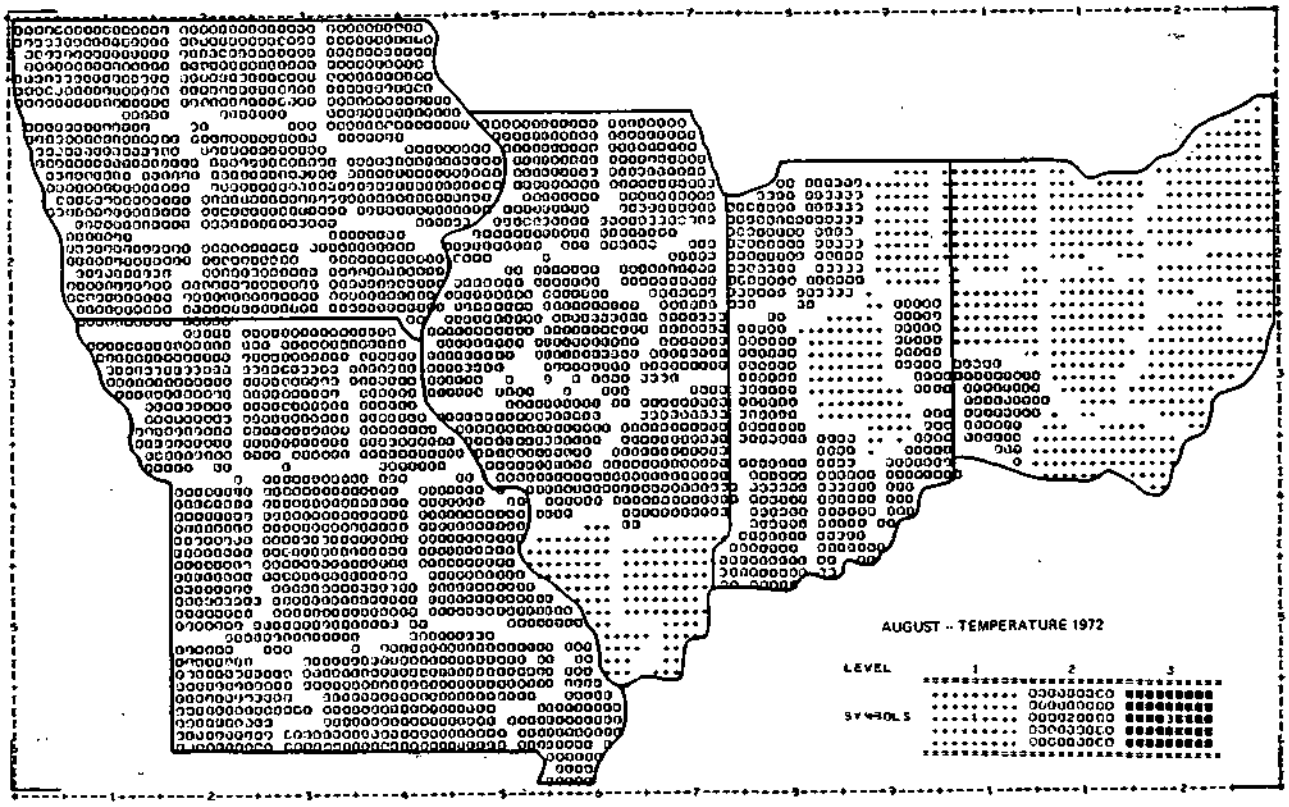
AUGUST -- TEMPERATURE 1972
LEVEL
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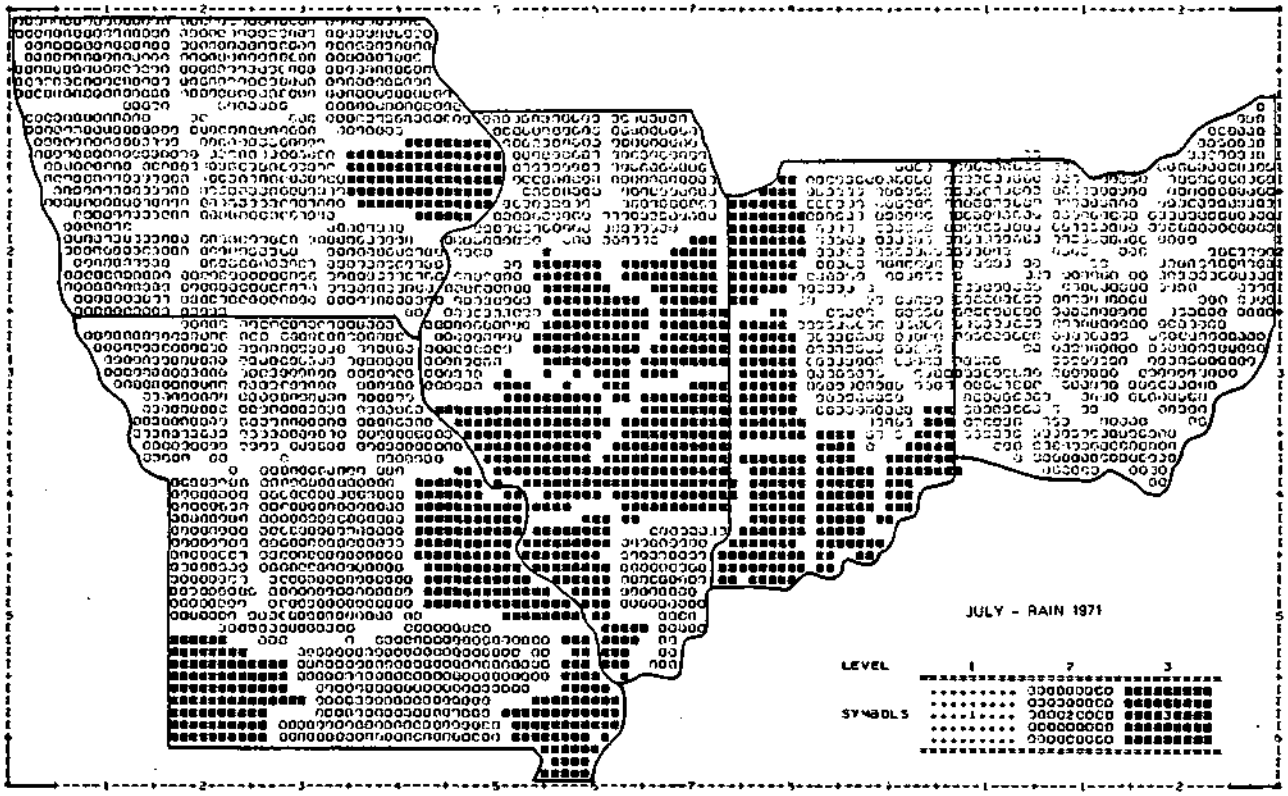
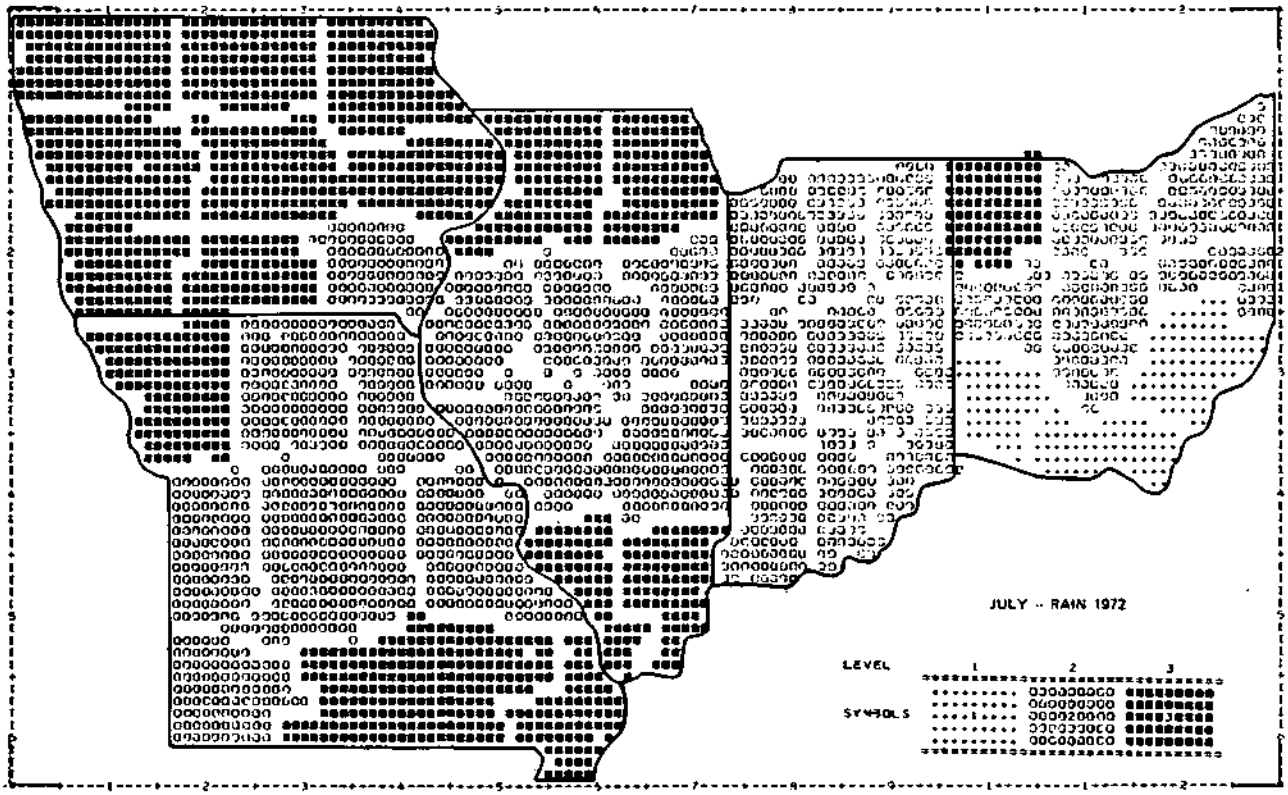
SYMBOLS


JULY - RAIN 1971
LEVEL
1
2
3
SYMBOLS


JULY - RAIN 1972
LEVEL
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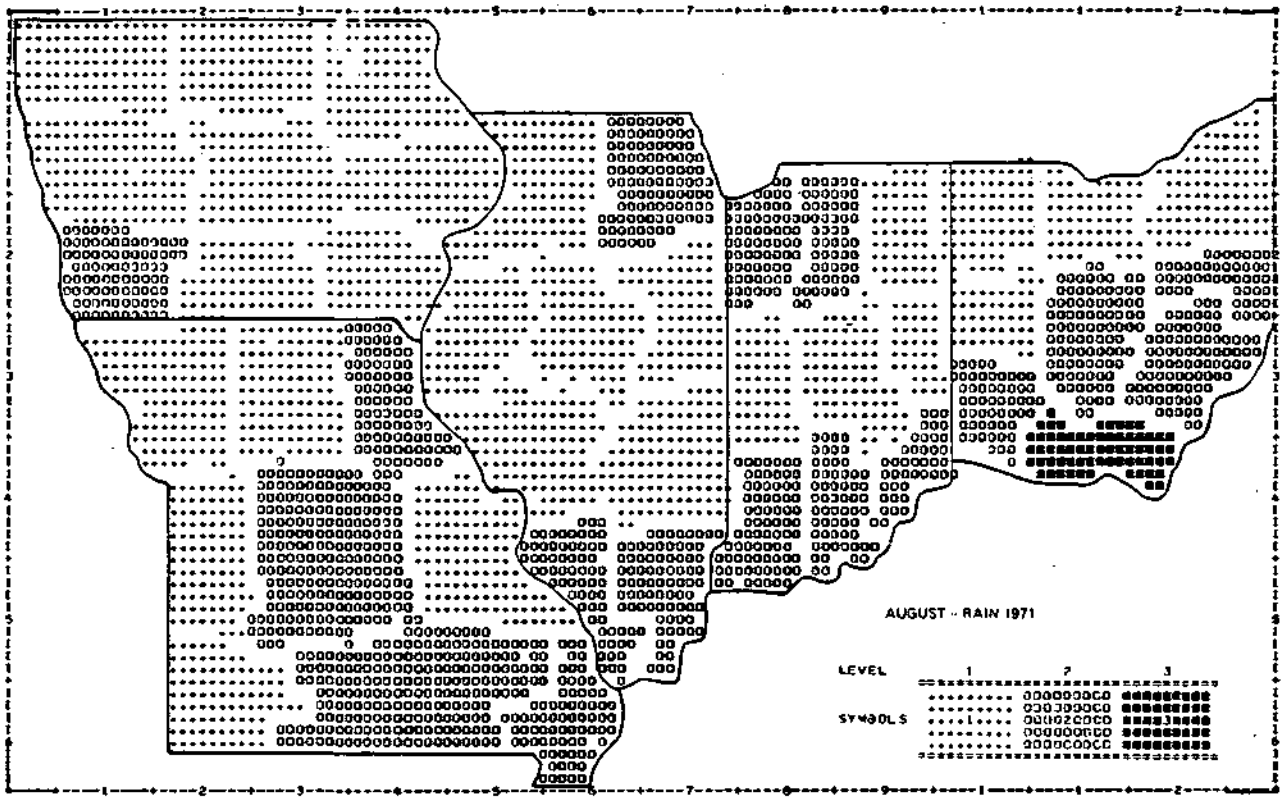
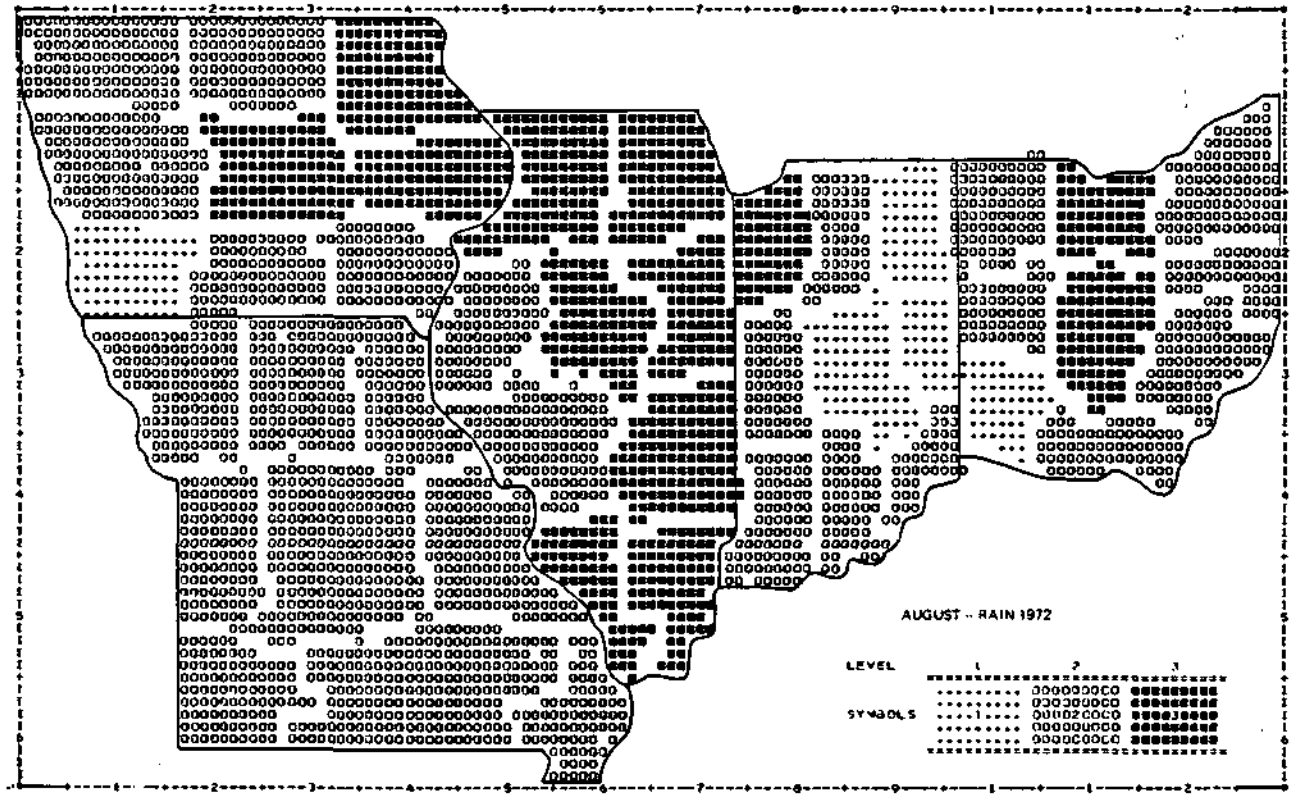
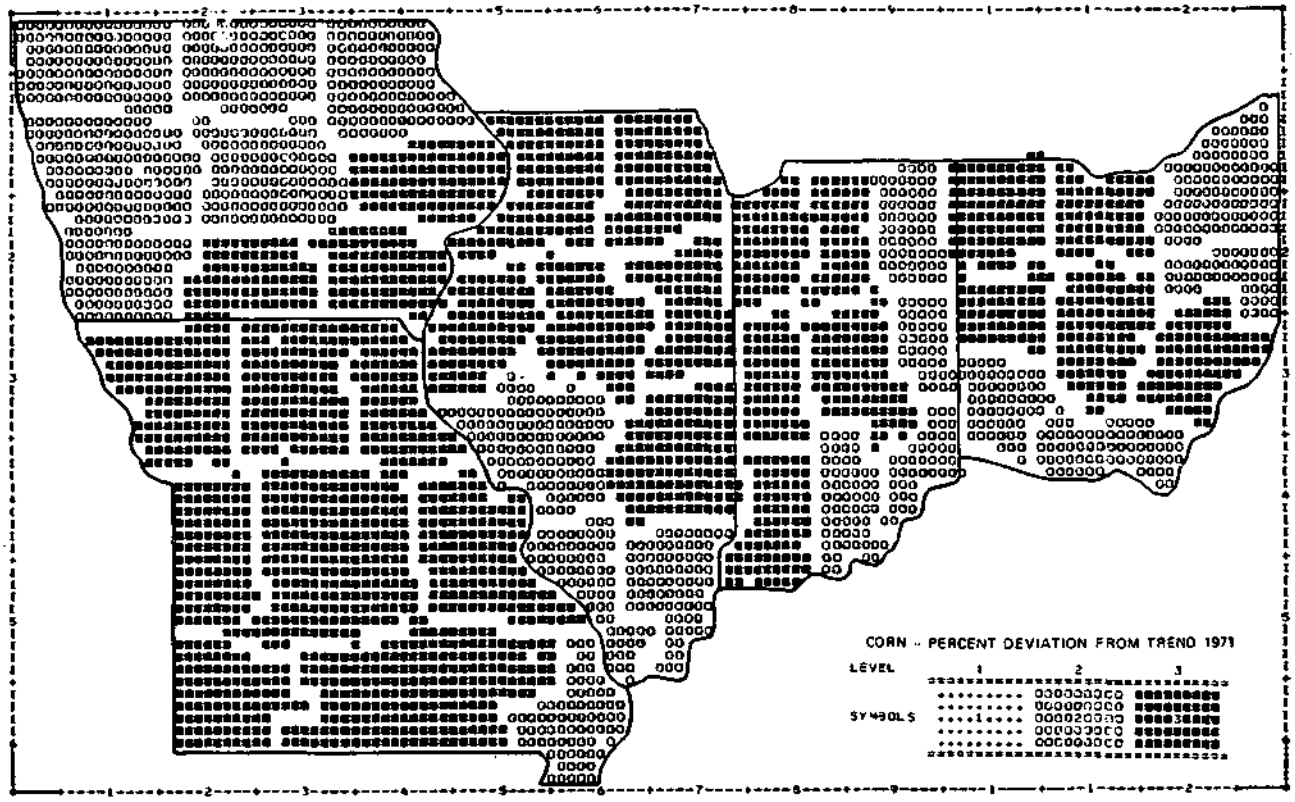
SYMBOLS


AUGUST - RAIN 1971
LEVEL 1 2 3
SYMBOLS


AUGUST - RAIN 1972
LEVEL 1 2 3
SYMBOLS


CORN -- PERCENT DEVIATION FROM TREND 1971
LEVEL
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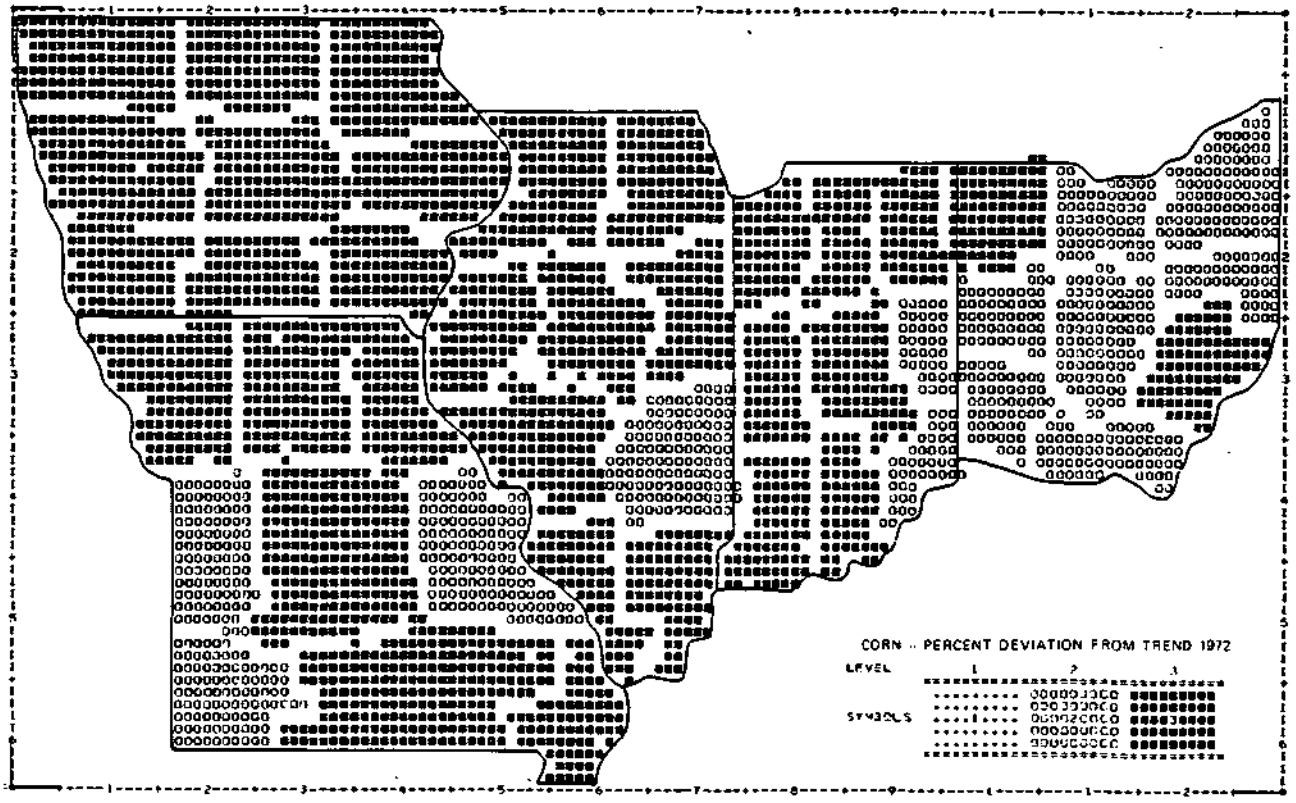
SYMBOLS


CORN -- PERCENT DEVIATION FROM TREND 1972
LEVEL
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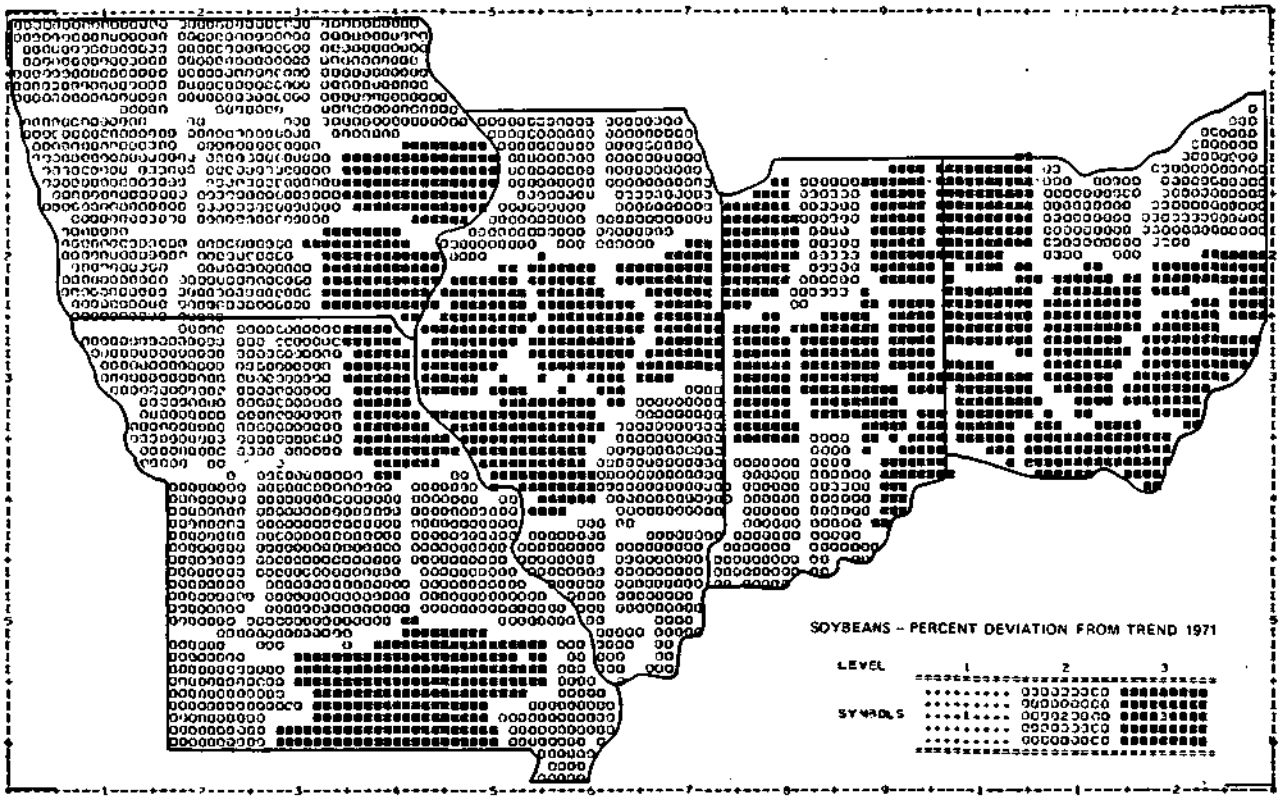
SYMBOLS


SOYBEANS - PERCENT DEVIATION FROM TREND 1971
LEVEL
1
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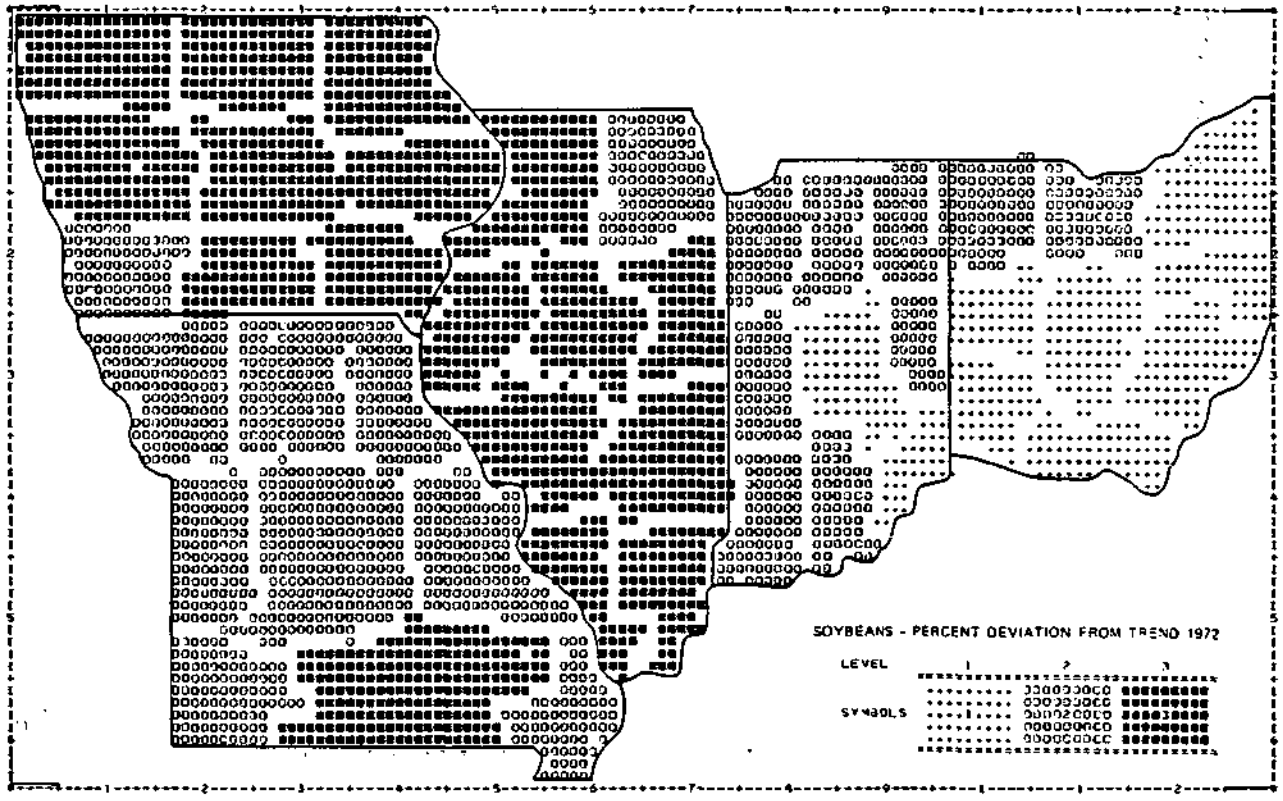
SYMBOLS


SOYBEANS - PERCENT DEVIATION FROM TREND 1972
LEVEL
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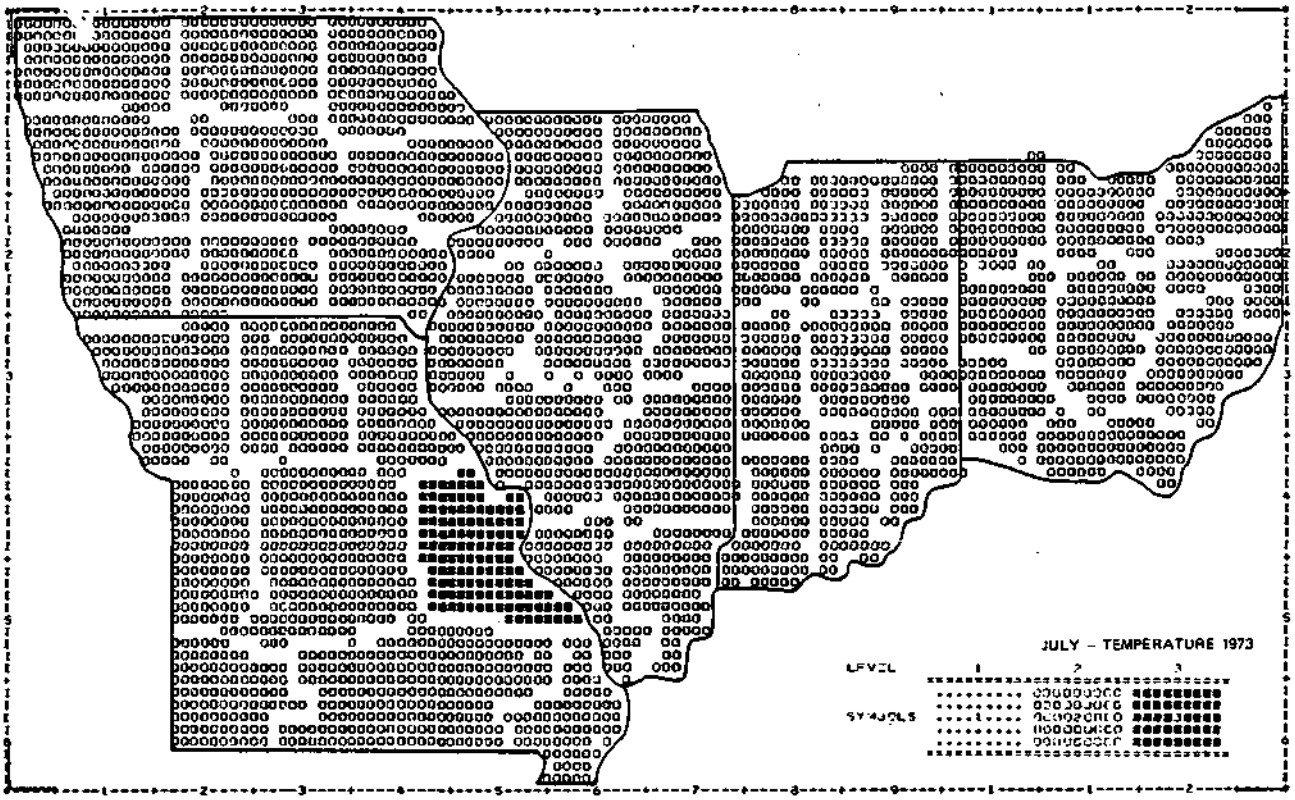
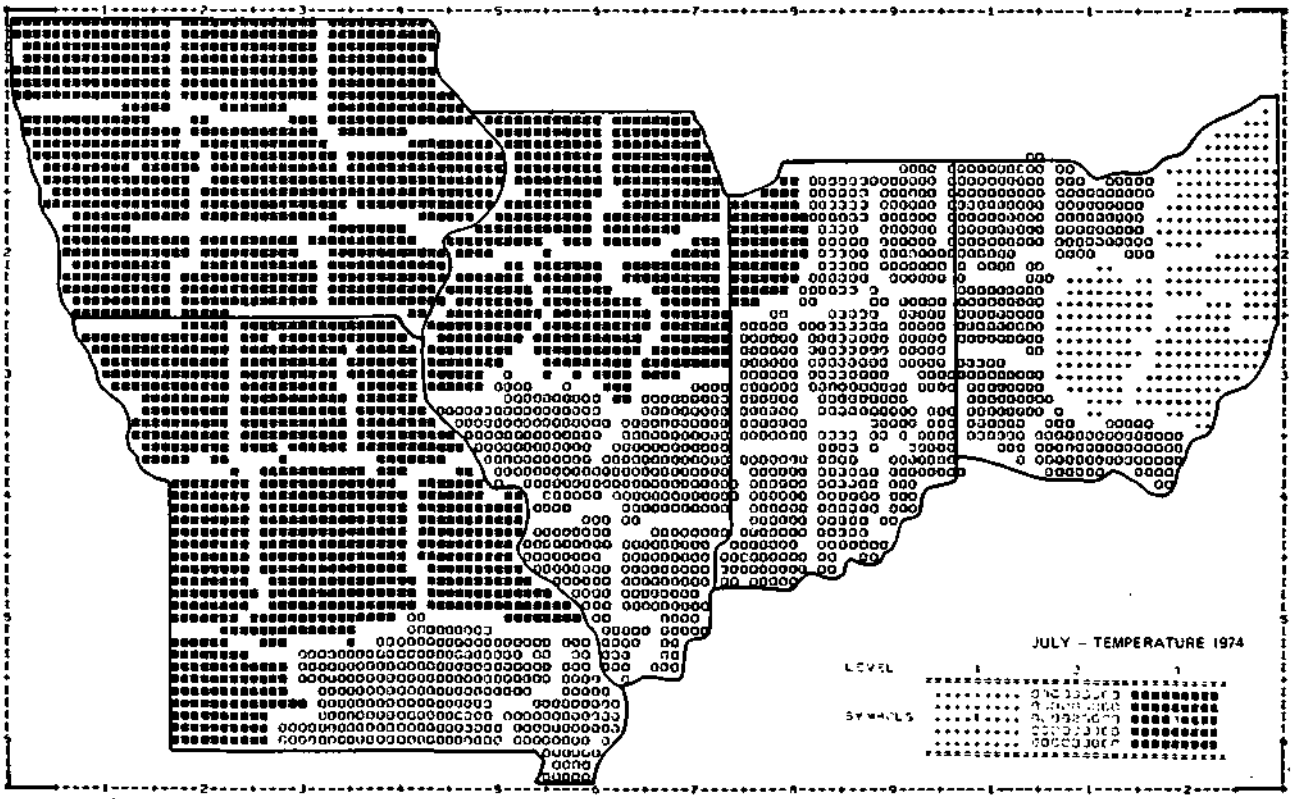
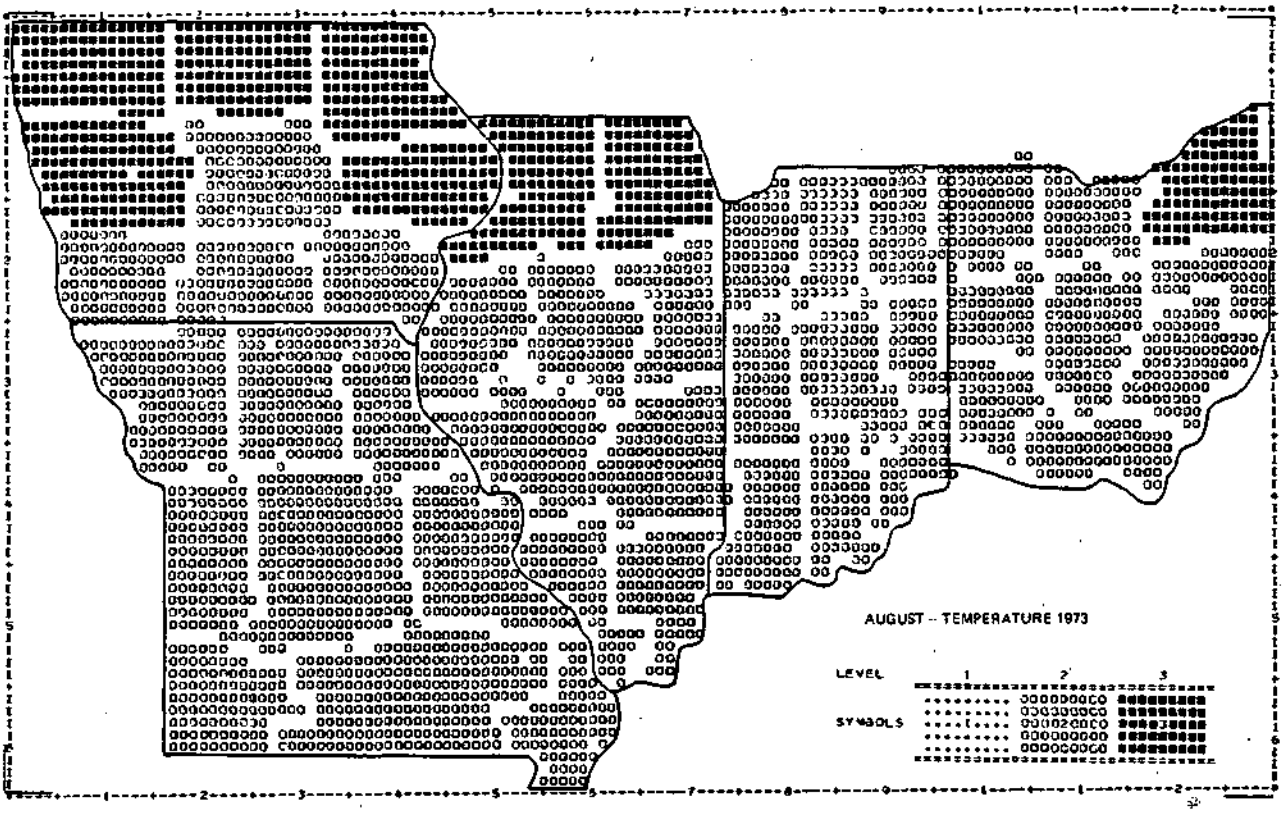
SYMBOLS


JULY – TEMPERATURE 1973
LEVEL
SYMBOLS


JULY – TEMPERATURE 1974
LEVEL
SYMBOLS


AUGUST -- TEMPERATURE 1973
LEVEL
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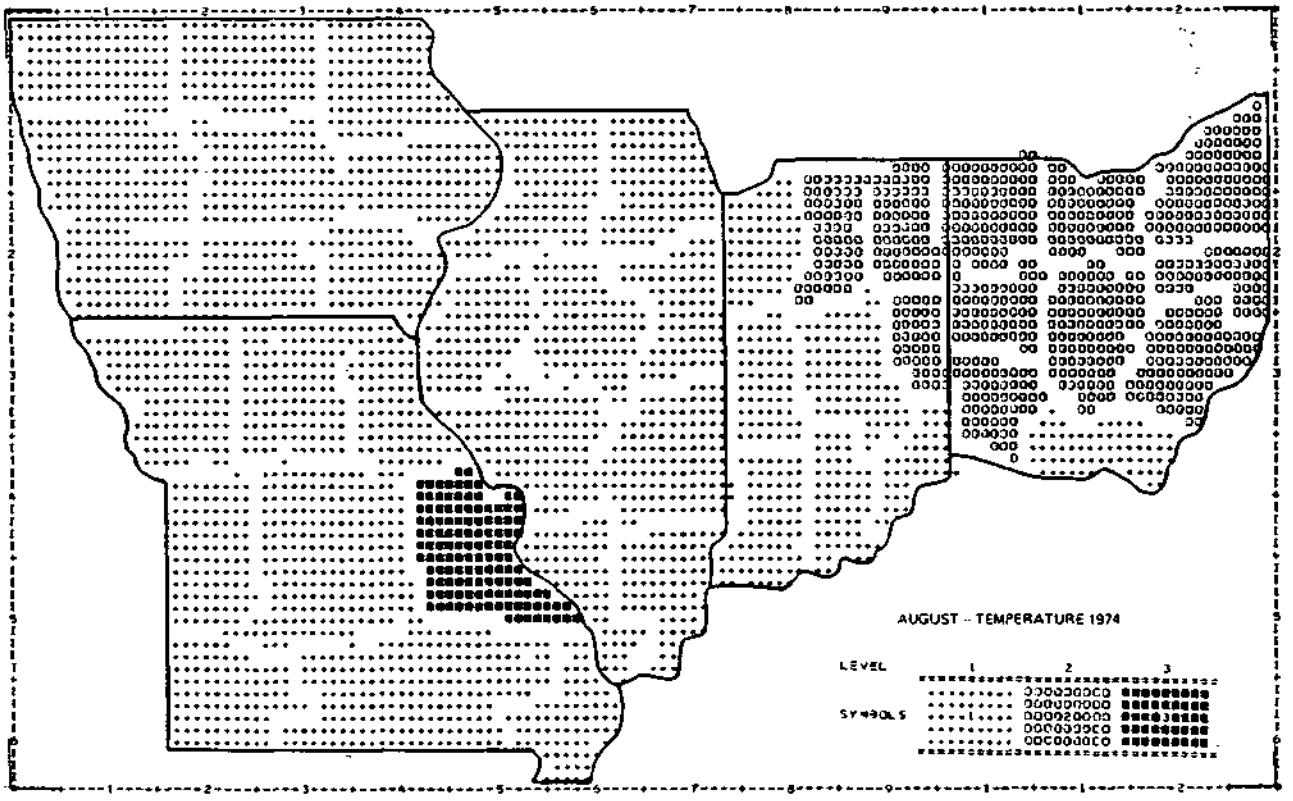
3
SYMBOLS


AUGUST -- TEMPERATURE 1974
LEVEL
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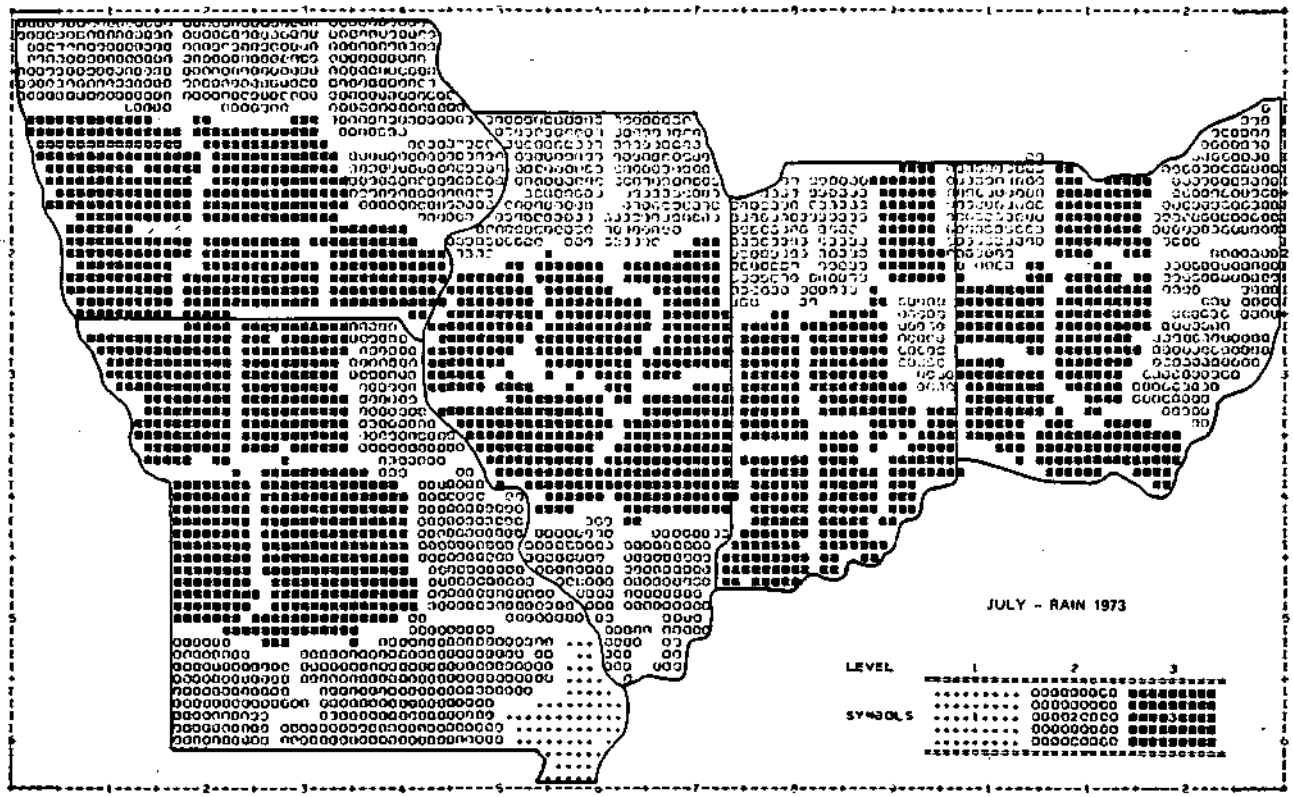
3
SYMBOLS


JULY - RAIN 1973
LEVEL
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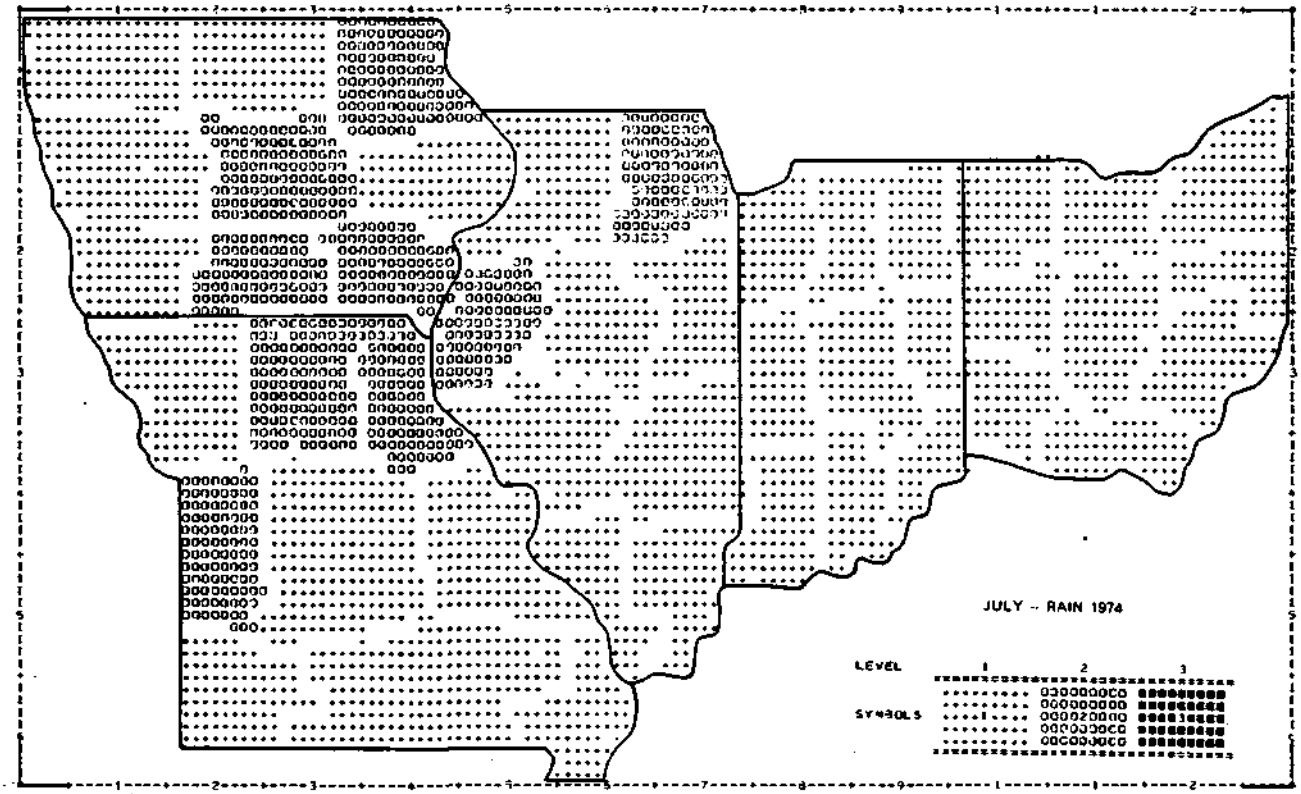
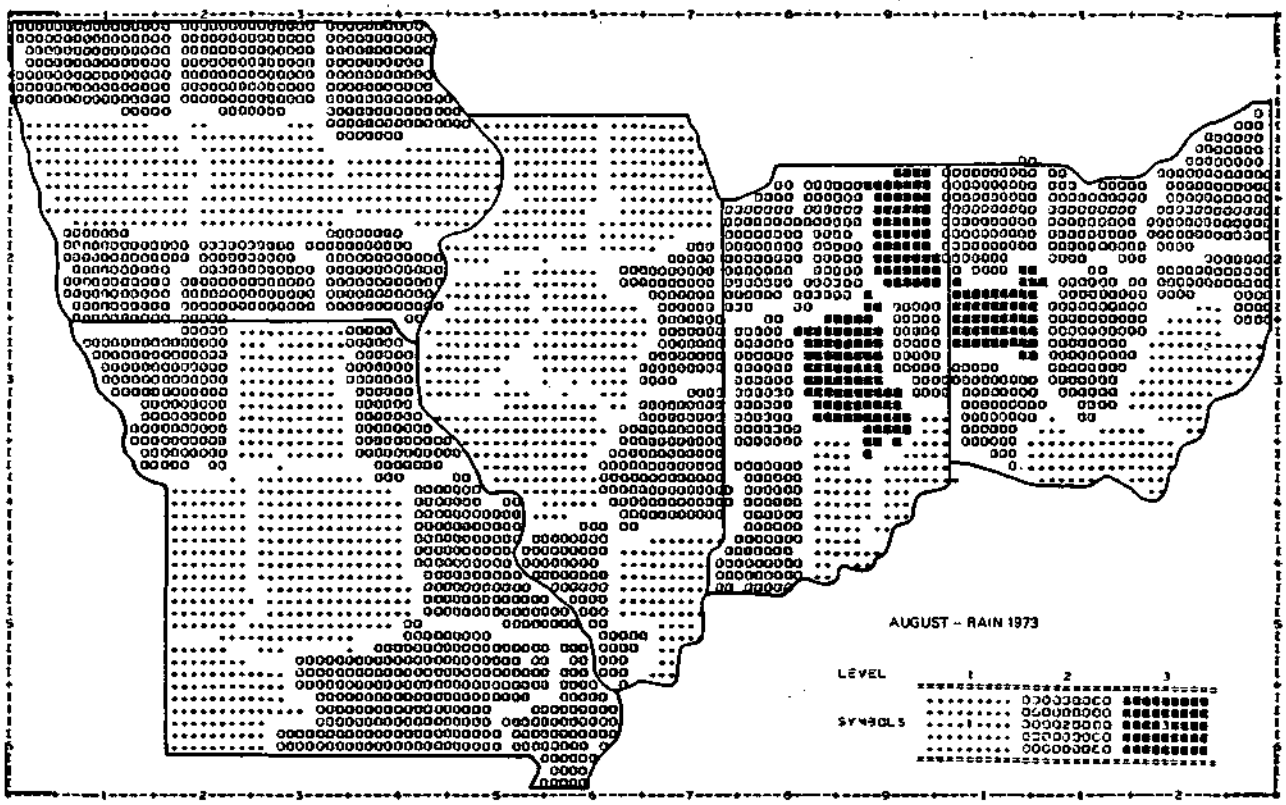
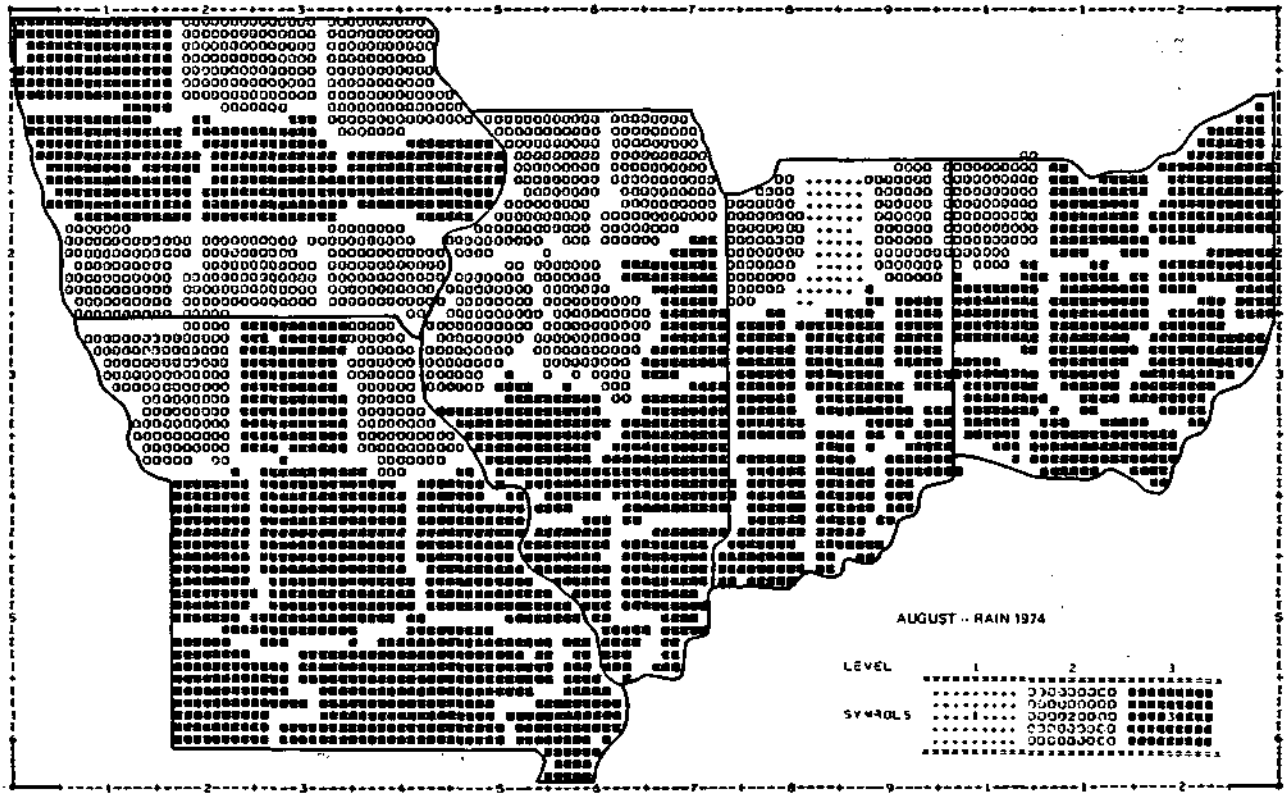
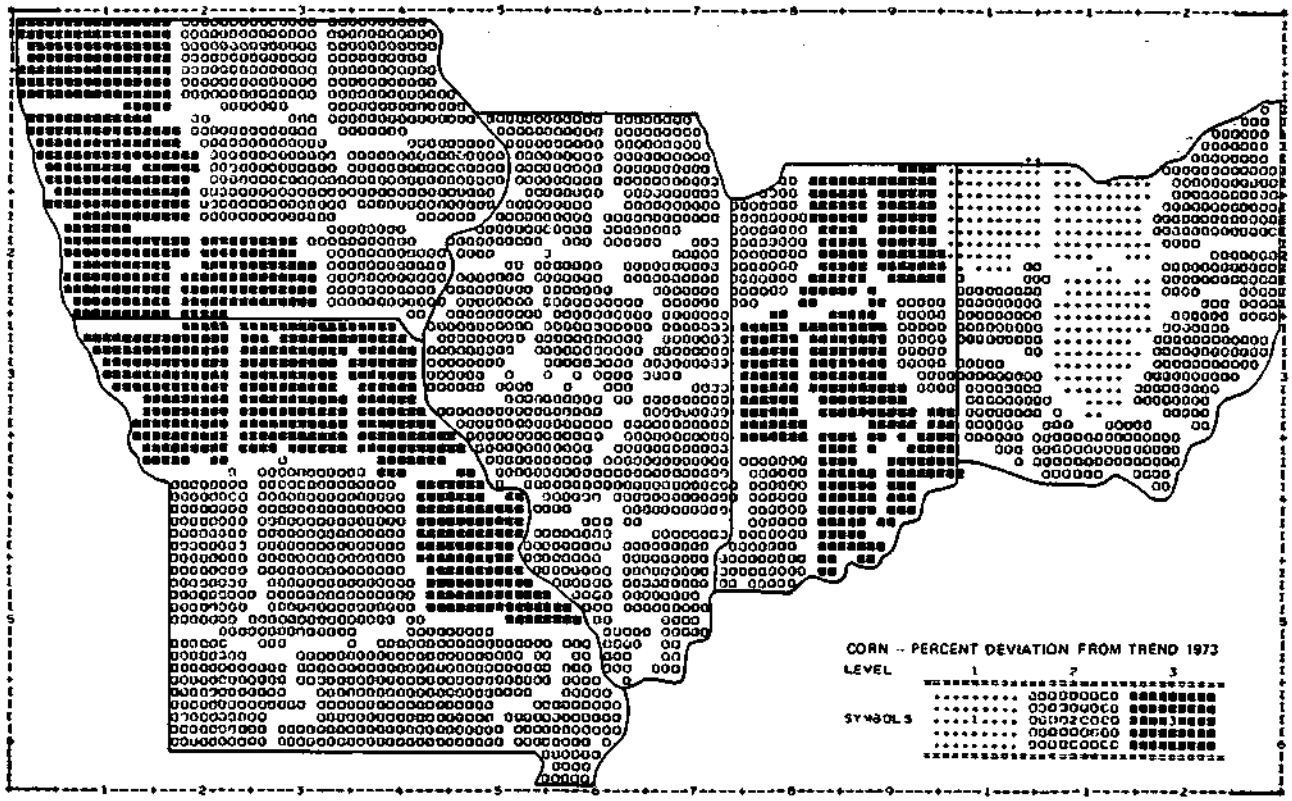
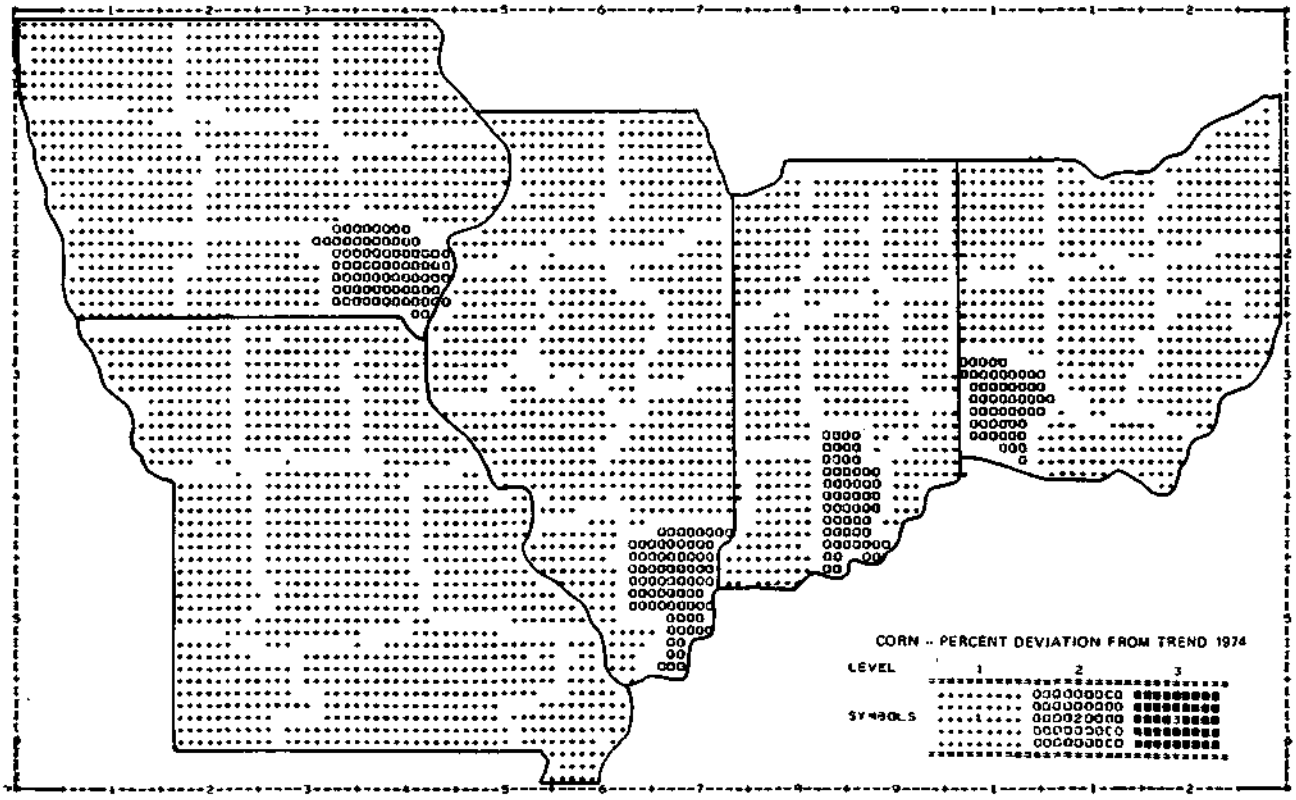
3
SYMBOLS

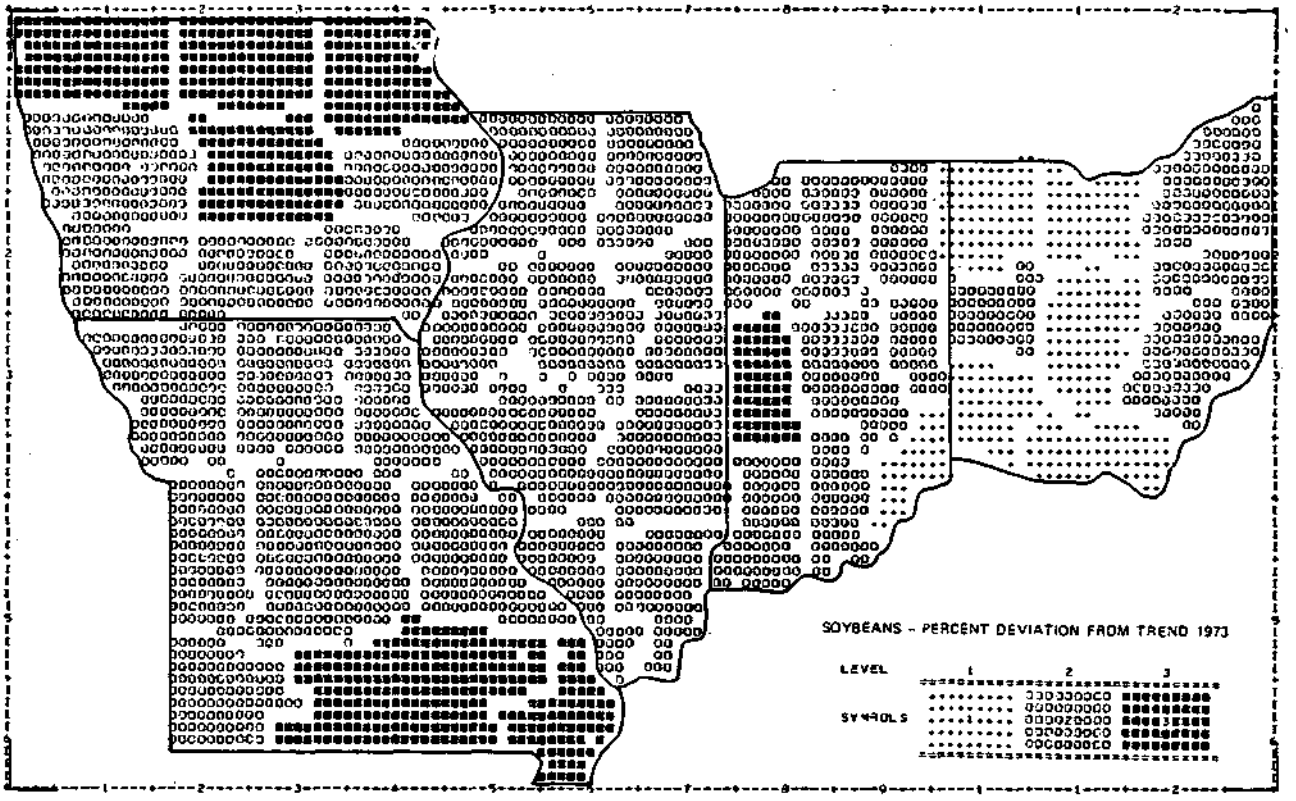

JULY - RAIN 1974
LEVEL
1
2
3
SYMBOLS

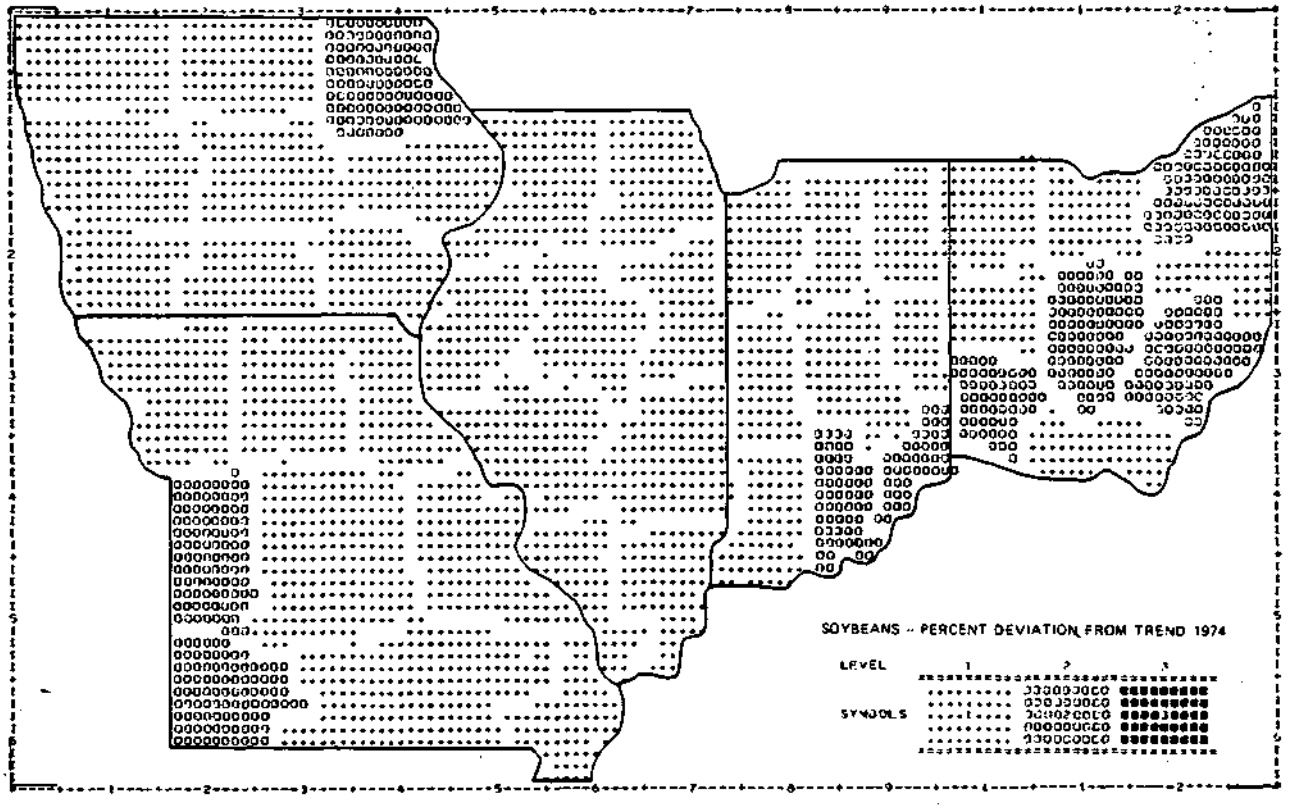

AUGUST -- RAIN 1973
LEVEL
1
2
3
SYMBOLS

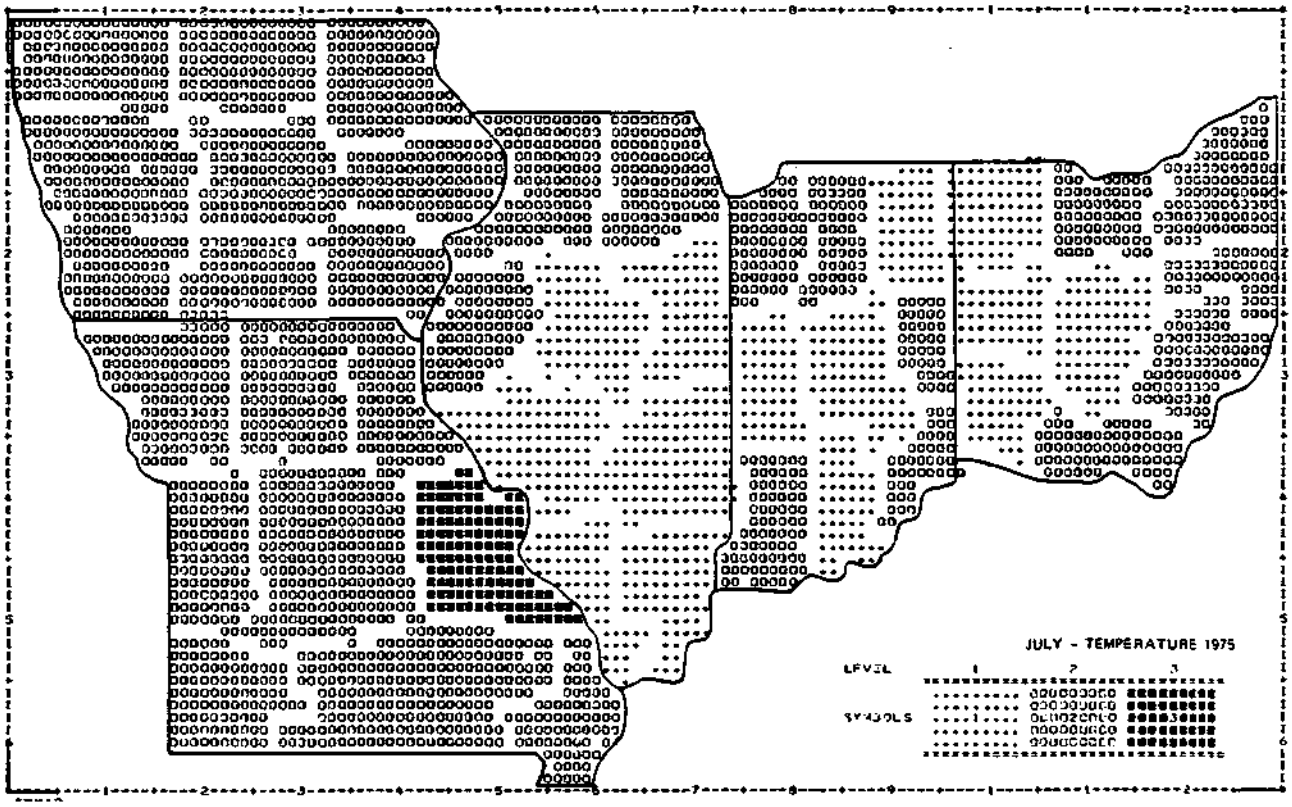

AUGUST -- RAIN 1974
LEVEL
1
2
3
SYMBOLS

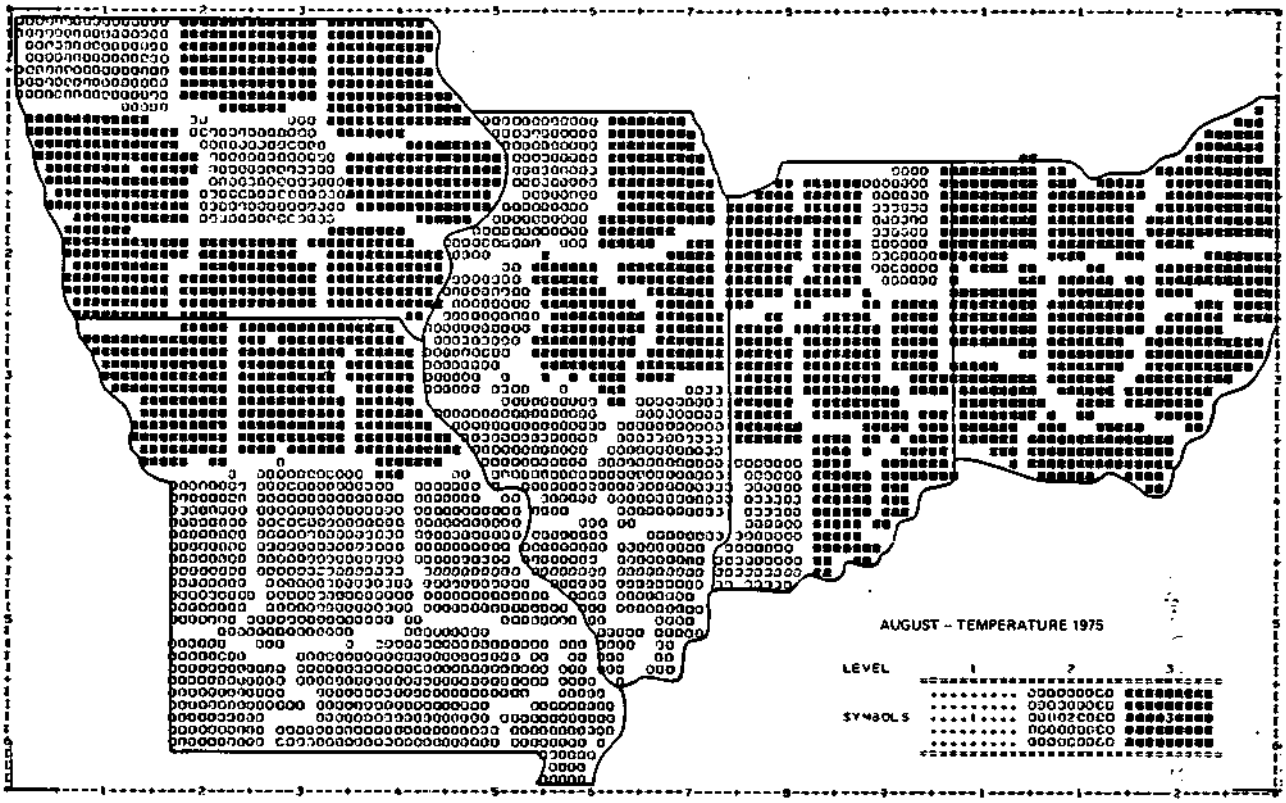

CORN -- PERCENT DEVIATION FROM TREND 1973
LEVEL
1
2
3
SYMBOLS

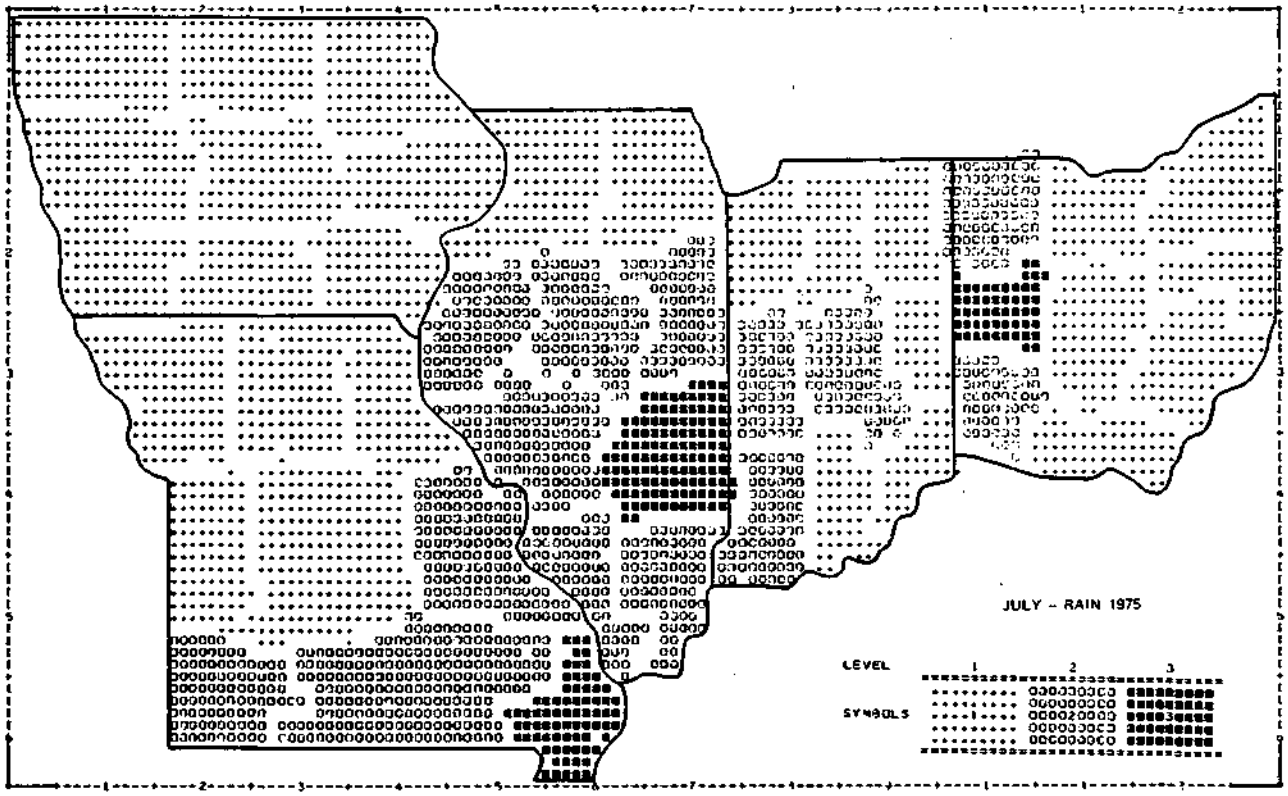

CORN -- PERCENT DEVIATION FROM TREND 1974
LEVEL
1
2
3
SYMBOLS

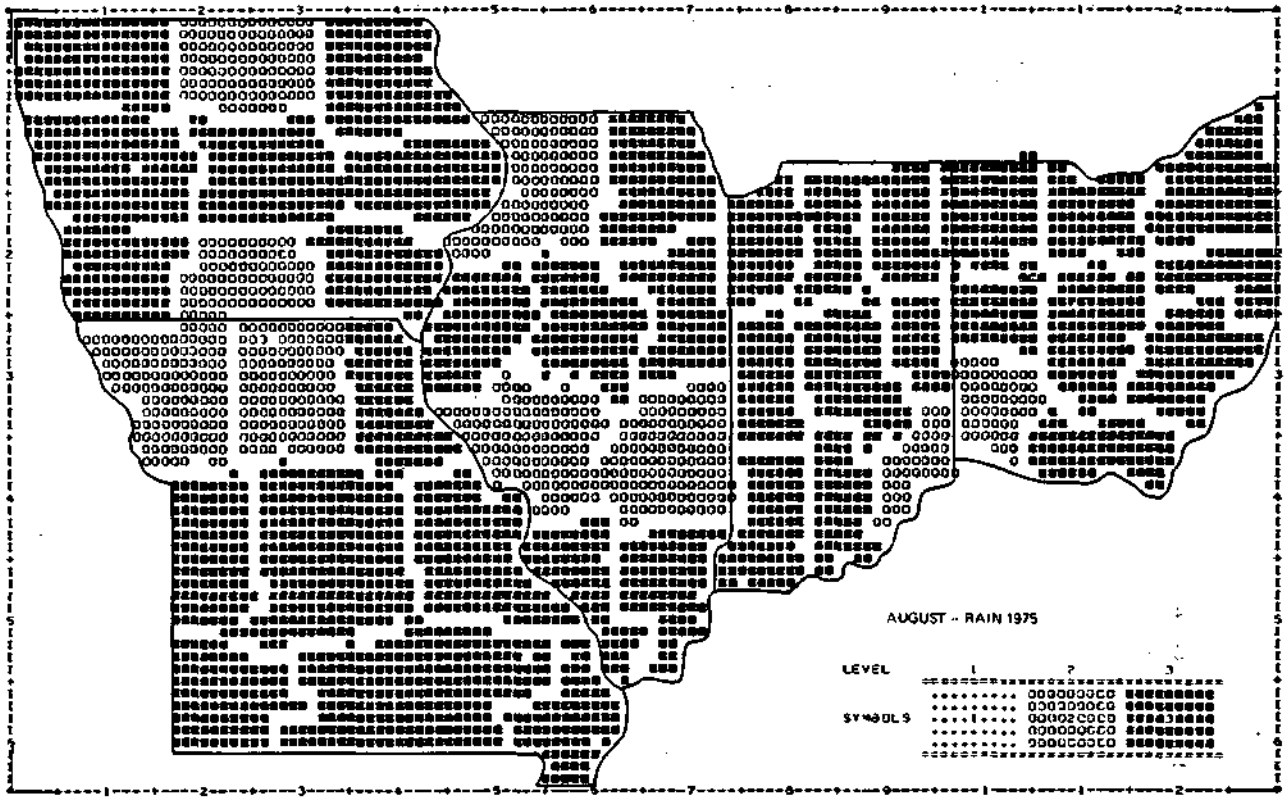

SOYBEANS - PERCENT DEVIATION FROM TREND 1973
LEVEL
1
2
3
SYMBOLS

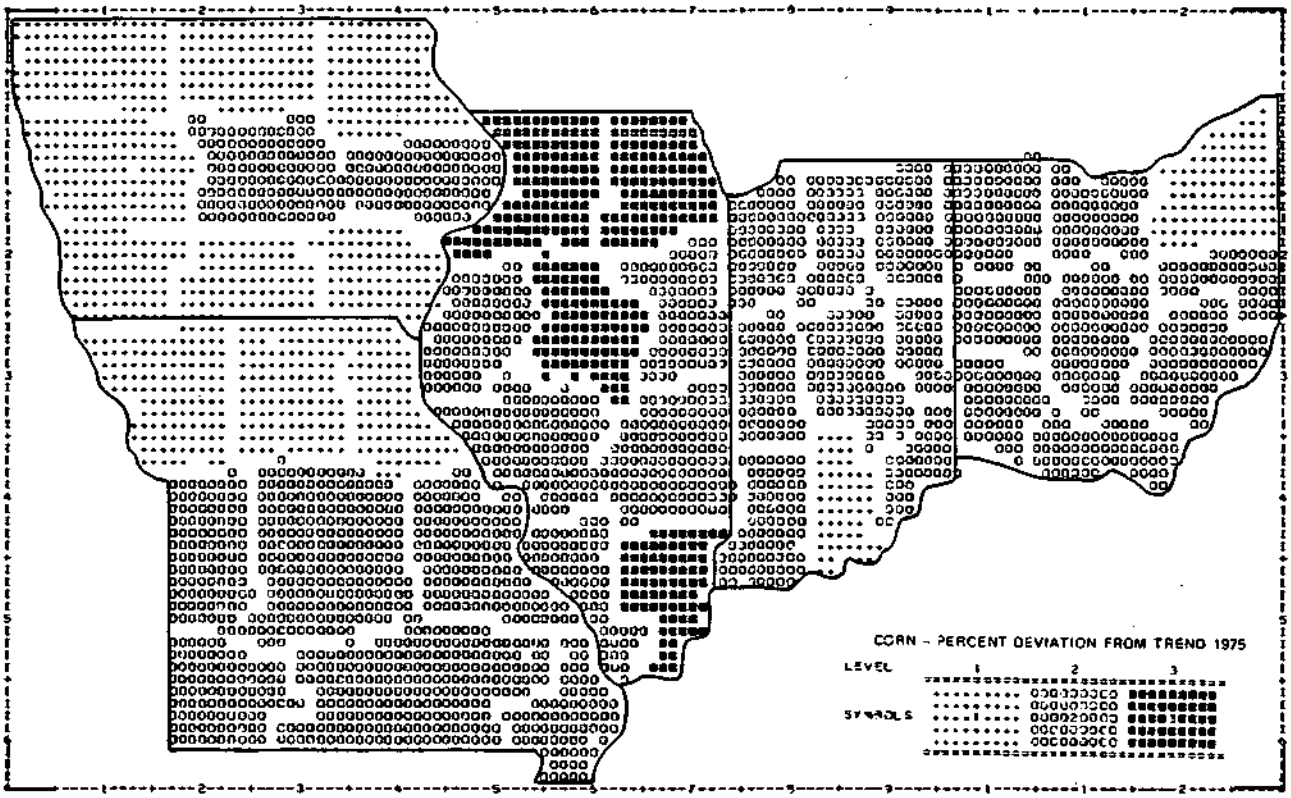

SOYBEANS - PERCENT DEVIATION FROM TREND 1974
LEVEL
1
2
3
SYMBOLS

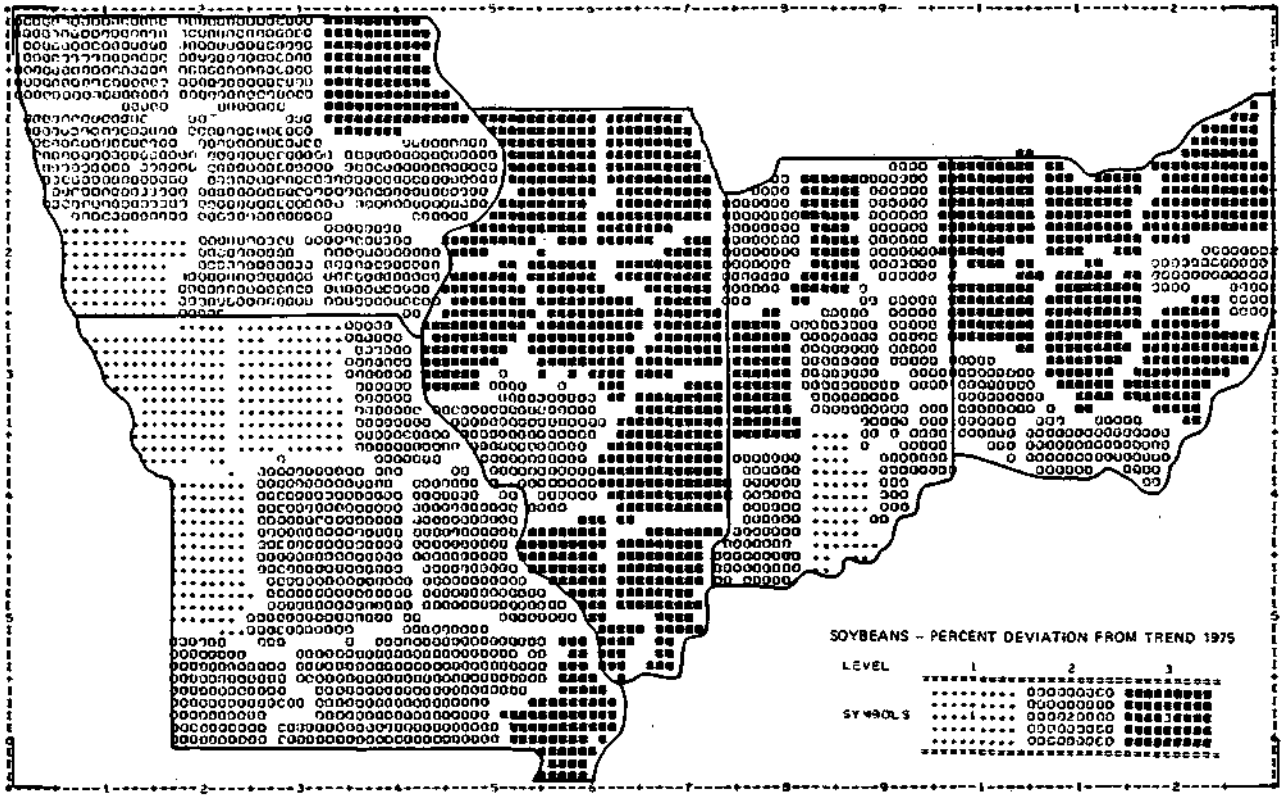

JULY - TEMPERATURE 1975
LEVEL
1
2
3
SYMBOLS


AUGUST -- TEMPERATURE 1975
LEVEL
1
2
3
SYMBOLS


JULY – RAIN 1975
LEVEL
1
2
3
SYMBOLS


AUGUST -- RAIN 1975
LEVEL
1
2
3
SYMBOLS


CORN - PERCENT DEVIATION FROM TREND 1975
LEVEL
1
2
3
SYMBOLS


SOYBEANS – PERCENT DEVIATION FROM TREND 1975
LEVEL
1
2
3
SYMBOLS