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SEMIMONTHLY DISTRIBUTION OF HAIL IN THE UNITED STATES [1]

By HOYT LEMONS

[State College of Washington, Pullman, Wash., February 1943]

Additional details on the pattern of hail distribution and frequency in the United States are illustrated by 24 semimonthly maps (figs. *1* to *24*). Other phases of the general subject of hail distribution and significance have been treated elsewhere.[2] [3] [4]

REGIONAL PATTERNS OF DISTRIBUTION

Two particular aspects of the Nation-wide hail pattern are noteworthy at the outset: (1) The pattern undergoes change constantly; (2) it is composed of three principal subphases, each with somewhat independent actions. The three regions containing the subphases are, roughly: (1) the interior, extending from the Ohio Valley to the basin and range country; (2) the east and southeast from the Ohio Valley to the Gulf and Atlantic coasts; (3) the Pacific area from the coast to the basin and range area.

In the interior region the warm season is accompanied by northward development and spread of hail activity; southward recession and diminution occur during the cool period. The norhward movement originates in the southern Great Plains in early February, spreading northward and eastward until late April (figs. 3–8), thereafter movement is northwestward over the Plains and northern Rockies until late June (figs. 9–12). Abatement of intensity follows (figs. 13–18), which, after mid-September, constitutes a southward recession. A hail-free area originates in Montana in early October (fig. 19). Wedge-like, it develops southward, meanwhile broadening east-westward in the north (figs. 20–24). By early January a hail-free corridor exists from the Canadian to the Mexican boundaries (fig. 1). This remains until the origin of the northward movement in February (figs. 1–2).

The Eastern region has light hail throughout, from mid-March until mid-June (figs. 6–12); thereafter, follows a slackening of hail, especially in coastal areas. A hail-free area appears to spread eastward and northward from the Texas coast, so that most of the inland sections are also hail-free by October (figs. 13–24). The chief exceptions are minor rugged areas. In early January light hail occurs in the south and gradually spreads (figs. 1–5). It should be emphasized that this cool season hail is chiefly a phenomenon of local turbulence.

In the Pacific area, hail is distinctly a cool season phenomenon,[5] summers being hail-free. Even in winter, however, the frequency of actual hail is low. Due to the source of data used, the accompanying maps overemphasize the importance of real hail in this area.[6]

Two movements are conspicuous during the cool season: (1) Southward spread and intensification of activity from early September to mid-January (figs. 17–24, 2;) much of the coastal areas proper experience mean semimonthly frequencies of 0.5–1.0 storms at this time. (2) Northward recession and diminution of activity during the latter part of the cool period, from early February to late May (figs. 3–10). From early June to late July, the hail-free area of the Pacific region extends eastward along much of the southwestern and southern borders of the country (figs. 11–14).

THE HAIL MAPS

The accompanying maps are presented as portraying the general pattern of hail occurrences for the country. Data for their construction were procured from all first-order Weather Bureau stations which keep such records. Their distribution is indicated in fig. 25. The occurrence of hail at these stations is assumed to be representative of that in their surrounding territories. Although all available records were utilized, the concentration of stations in the East and Midwest makes for more accurate portrayal of conditions there than in the far West. Due to the extremely local nature of individual hailstorms and to the relative fewness of observing stations, it is impossible to make an actual micro-climatological study of this nature over the vast extent of continental United States. Angot of the French Meteorological Service has estimated that it would be necesssary to have a statiou for every 4 square miles if accurate, detailed observations were to be secured. An indirect approach for local studies, might utilize hail insurance damage statistics.

HOURLY DISTRIBUTION OF DAMAGING HAILSTORMS

Although damaging hailstorms may occur at any time in the 24-hour interval, maximum frequency is obtained in the late afternoon, at 5:30 o'clock, being built up after a minimum in the early morning hours (fig. 27). During the 14-year period, 1926–39, one-third of all damaging hailstorms which were recorded came during the interval between 4 and 6 p. m.; two-thirds occurred between 1 and 7 p. m. that is, within in the afternoon quarter of the day.

PATHS OF DAMAGING HAILSTORMS

The most common width of track of damaging hailstorms is 1 to 2 miles (fig. 26). Data on the paths of 2,105 hailstorms which occurred during the 14 year-period, 1926–39, were used. Approximately one-fourth of these storm tracks were 1 to 2 miles in width. Width varied considerably, however, ranging from a few yards to 75 miles.

[1] Paper included on the 1942 program of the Association of American Geographers.

[2] Lemons, Hoyt, "Hail as a Factor in the Regional Climatology of the United States," *Geographic Review*, July 1942. Maps and explanatory discussion of the annual, seasonal, and monthly patterns of hail distribution and frequency.

[3] Lemons, Hoyt, "Hail in High and Low Latitudes," *Bulletin of the American Meteorological Society*, February 1942. Explanatory discussion of hail occurrence in those areas where it constitutes less of a menace.

[4] Lemons, Hoyt, "Hail in American Agriculture," *Economic Geography*, October 1942. Discussion of the economic implications of hail to agriculture.

[5] According to observations of Weather Bureau officials and of the author in the region, much of the so-called hail is actually small hail. These small, white, opaque pellets are easily distinguishable from the larger, harder, concentric-layered hailstones. See also, Lemons, Hoyt, "Hail as a Factor in the Regional Climatology of the United States," *Geographical Review*, July 1942.

[6] Weather Bureau data, on which the maps are based, include small hail data along with those of hail.

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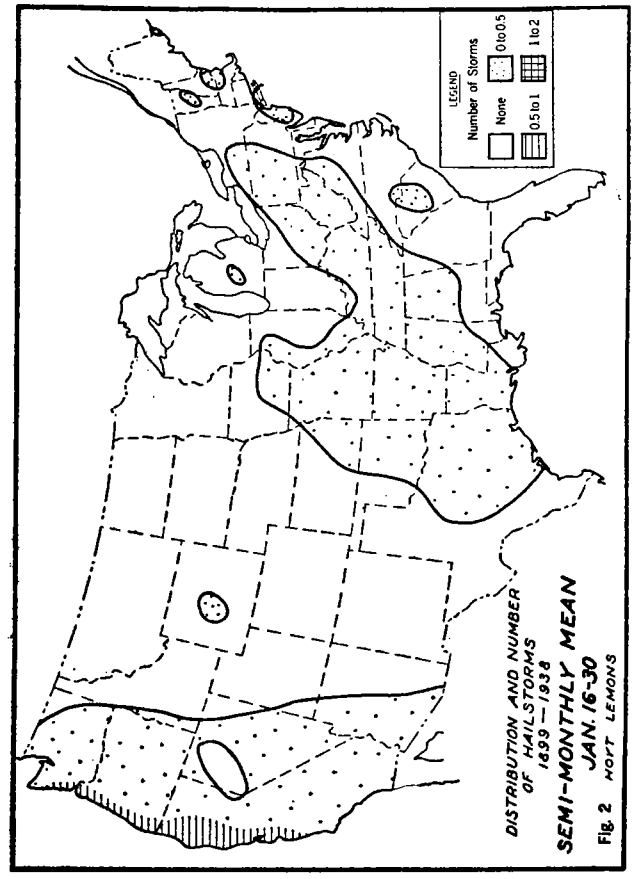
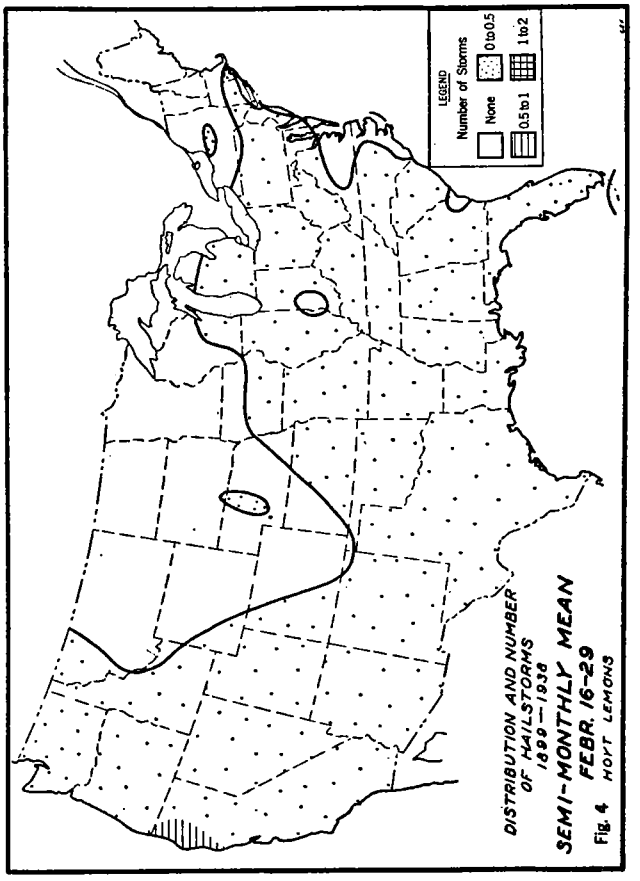
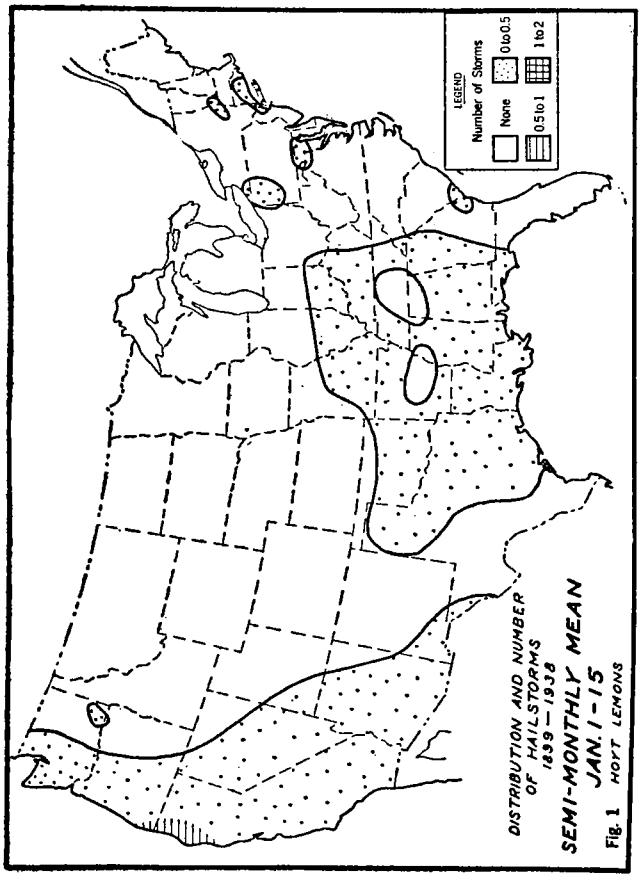
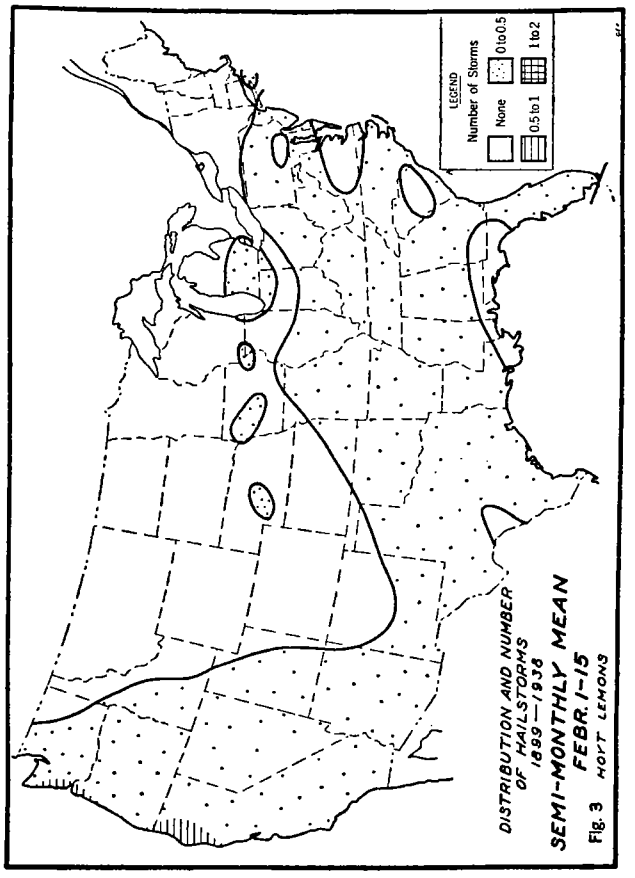
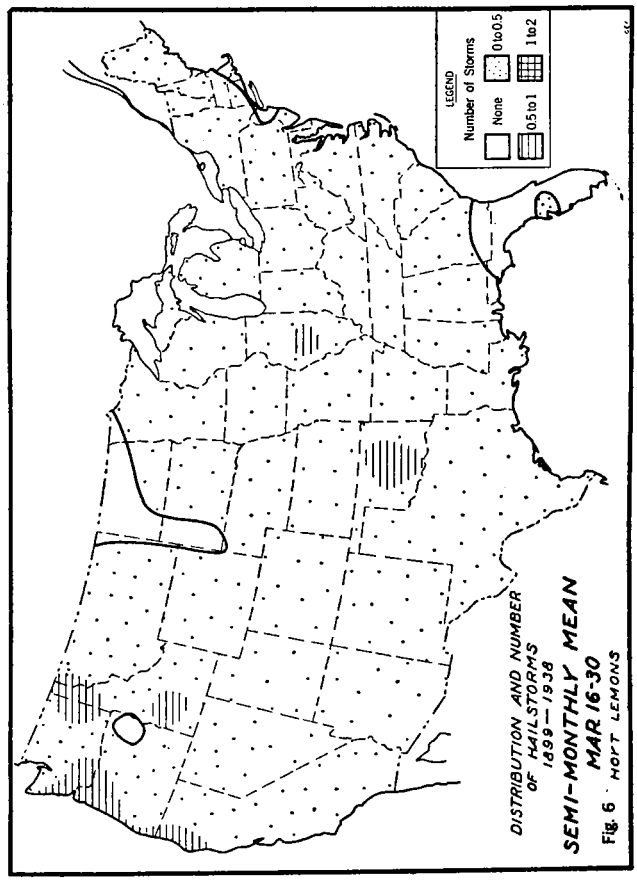
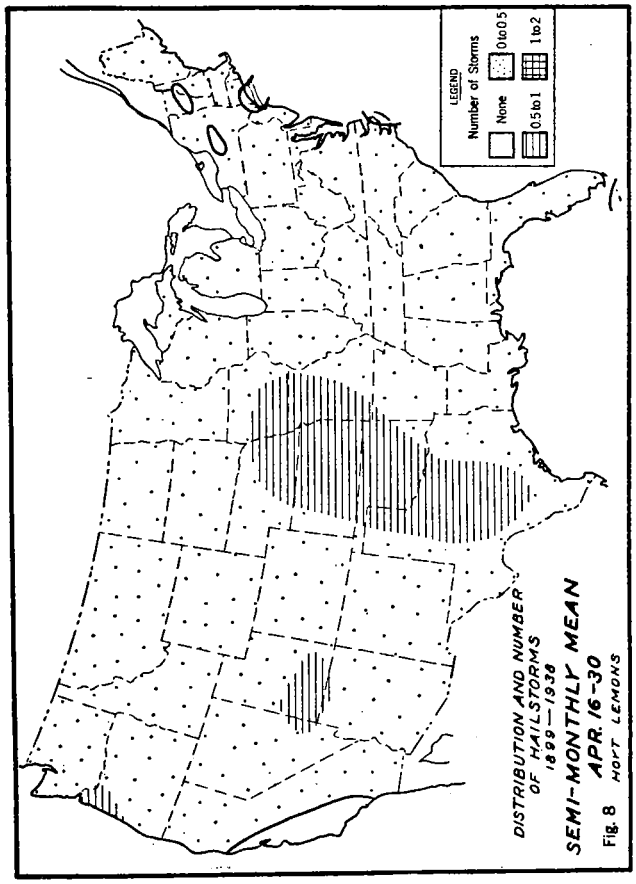

LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN
JAN. 16-30
Fig. 2 HOYT LEMONS

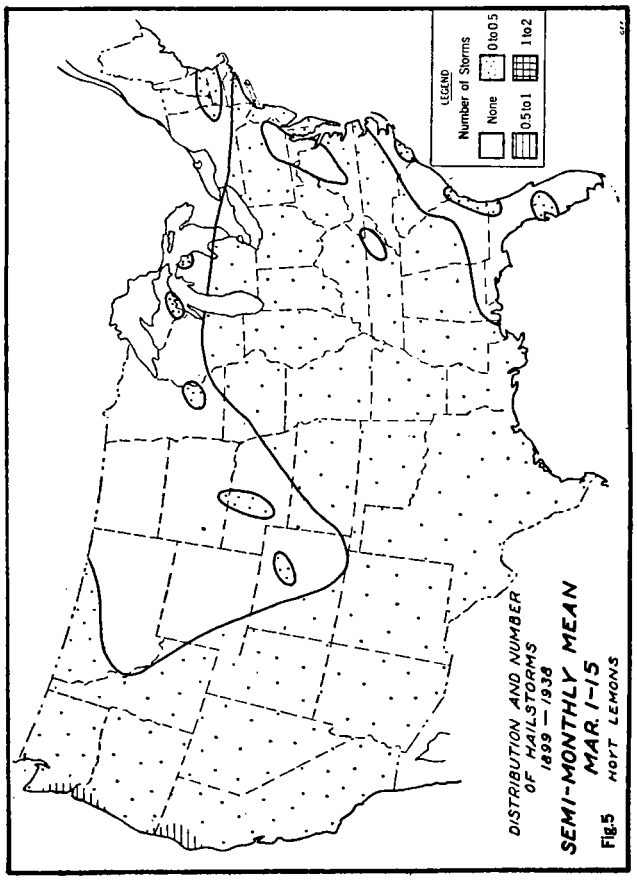

LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN
FEBR. 16-29
Fig. 4 HOYT LEMONS

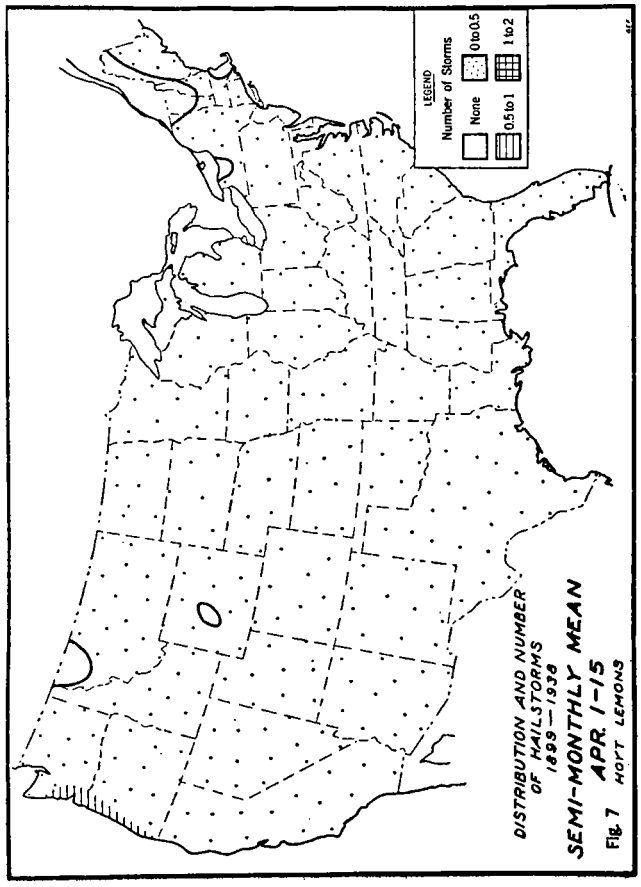

LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN
JAN. 1-15
Fig. 1 HOYT LEMONS


LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN
FEBR. 1-15
Fig. 3 HOYT LEMONS


LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN
MAR 16-30
Fig. 6 HOYT LEMONS


LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN
APR. 16-30
Fig. 8 HOYT LEMONS


LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN
MAR. 1-15
Fig.5 HOYT LEMONS


LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN
APR. 1-15
Fig. 7 HOYT LEMONS

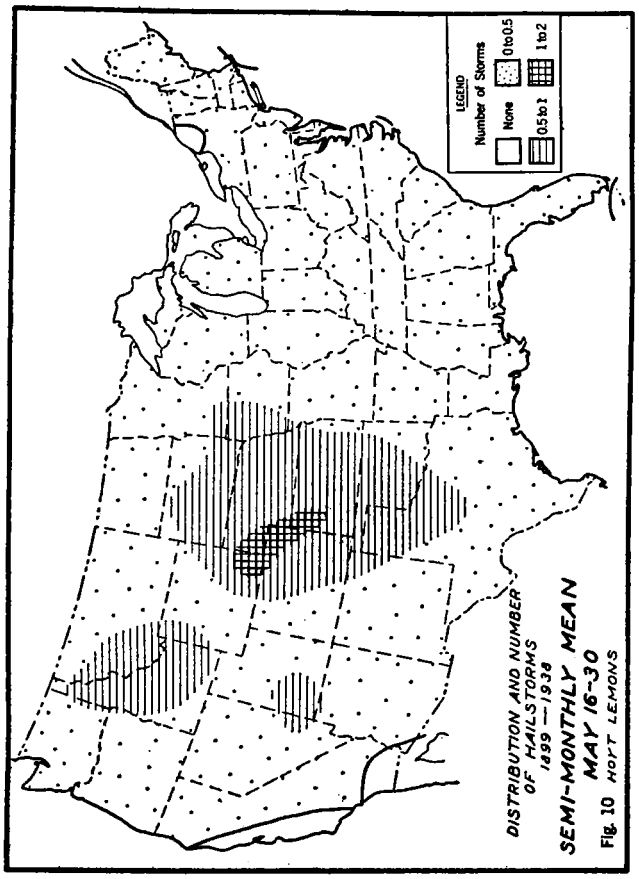
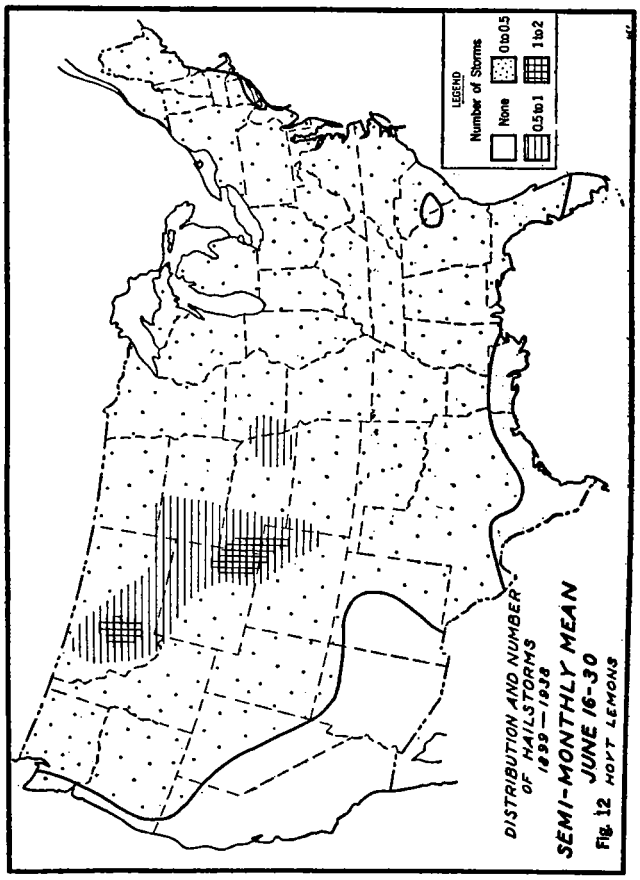


Fig. 10



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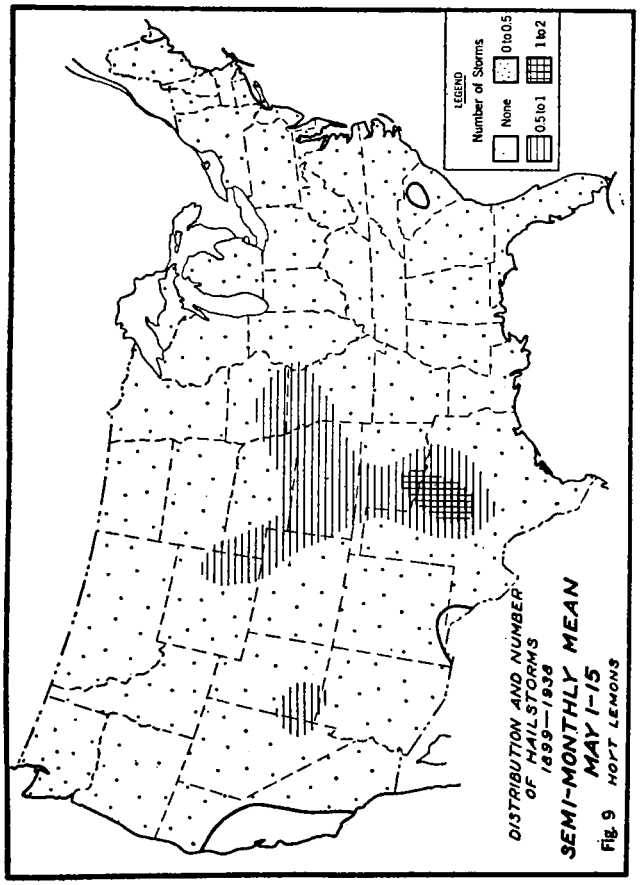

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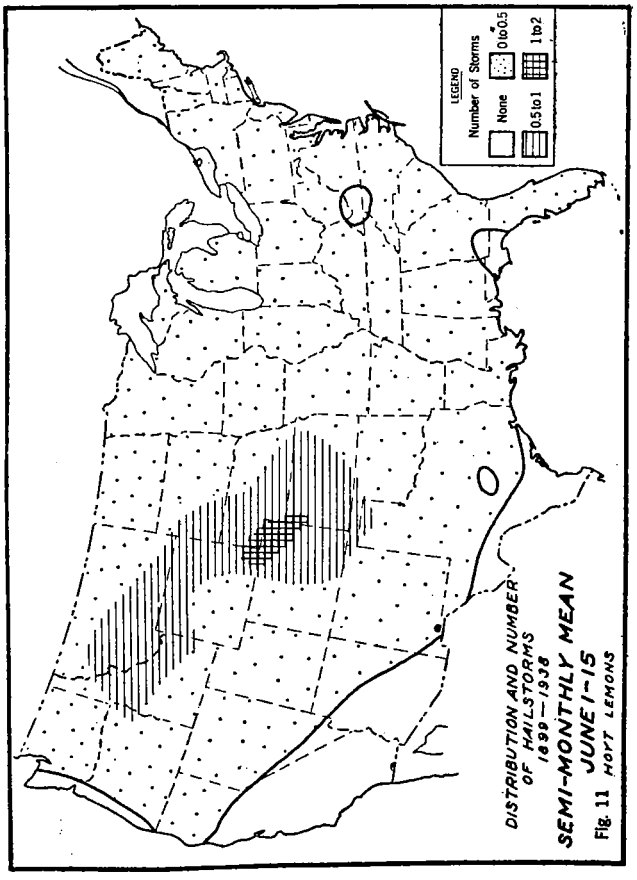
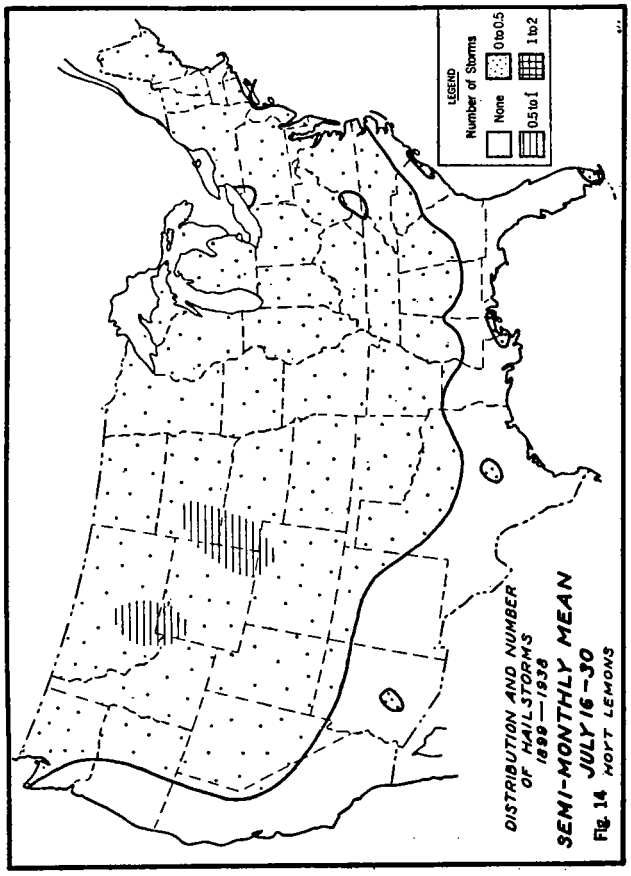
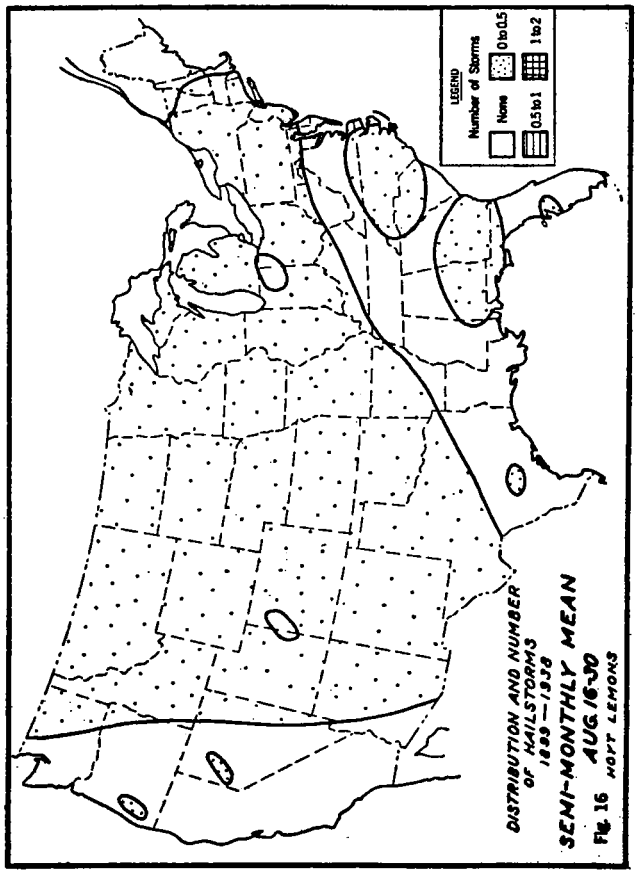
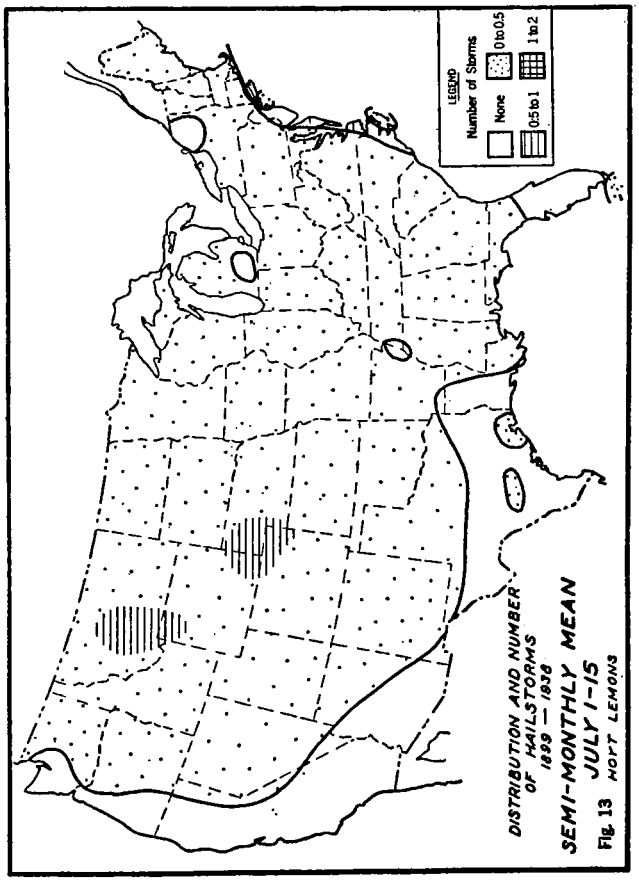
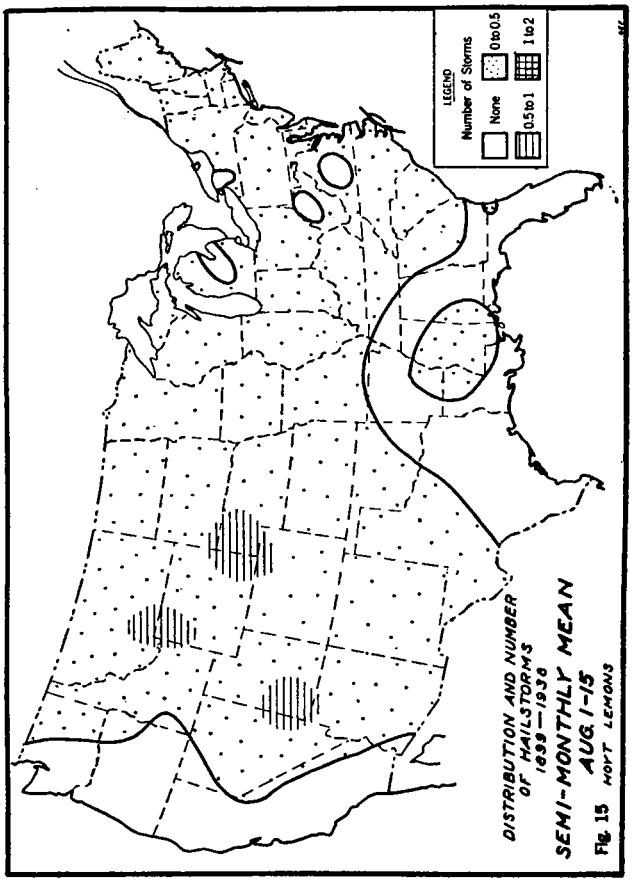


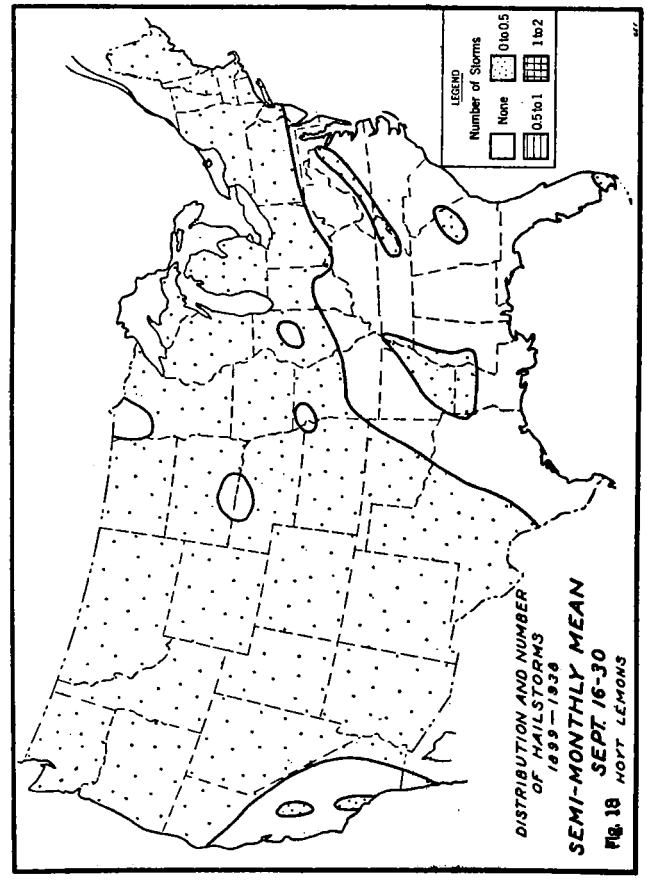
Fig. 11

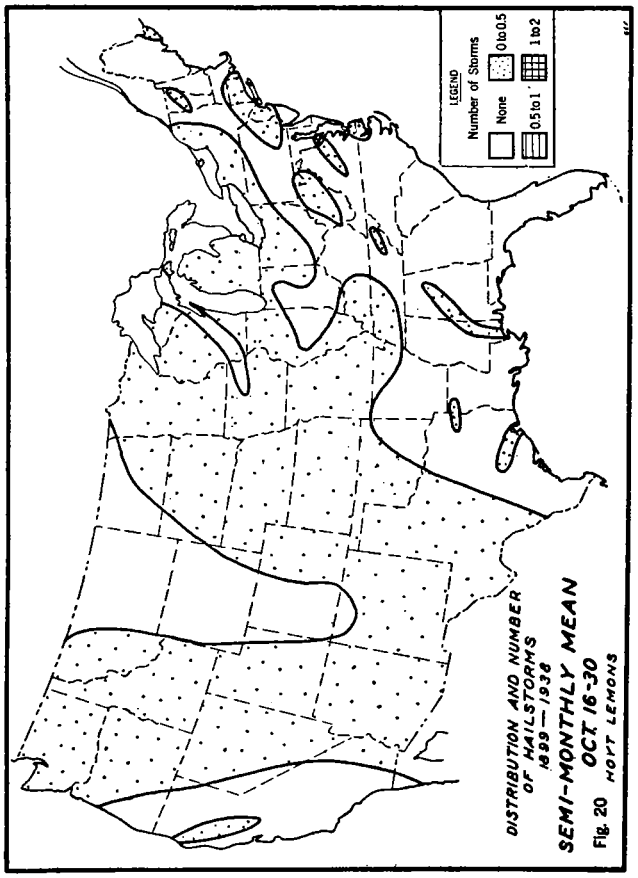

LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN
JULY 16-30
Fig. 14 HOYT LEMONS

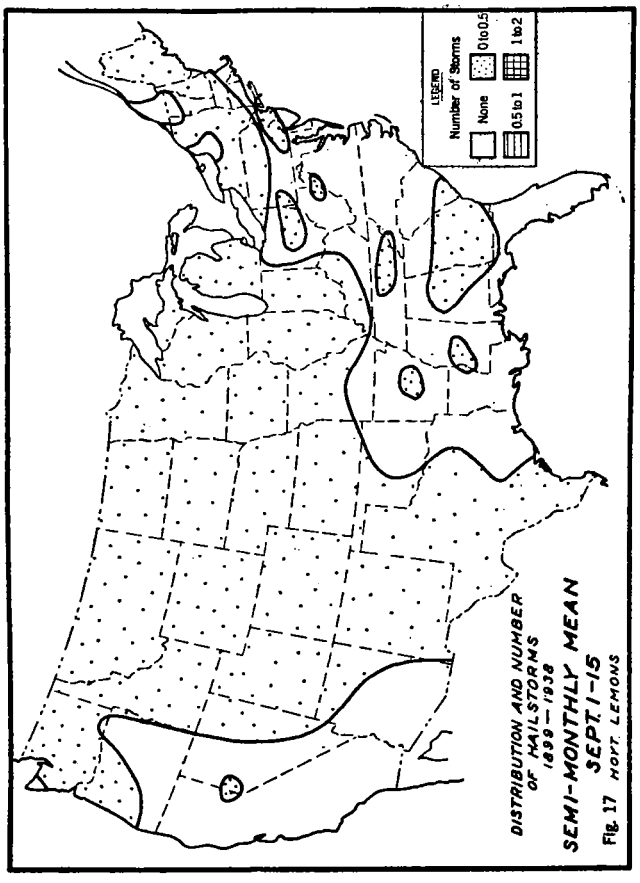

LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN
AUG. 16-30
Fig. 16 HOYT LEMONS

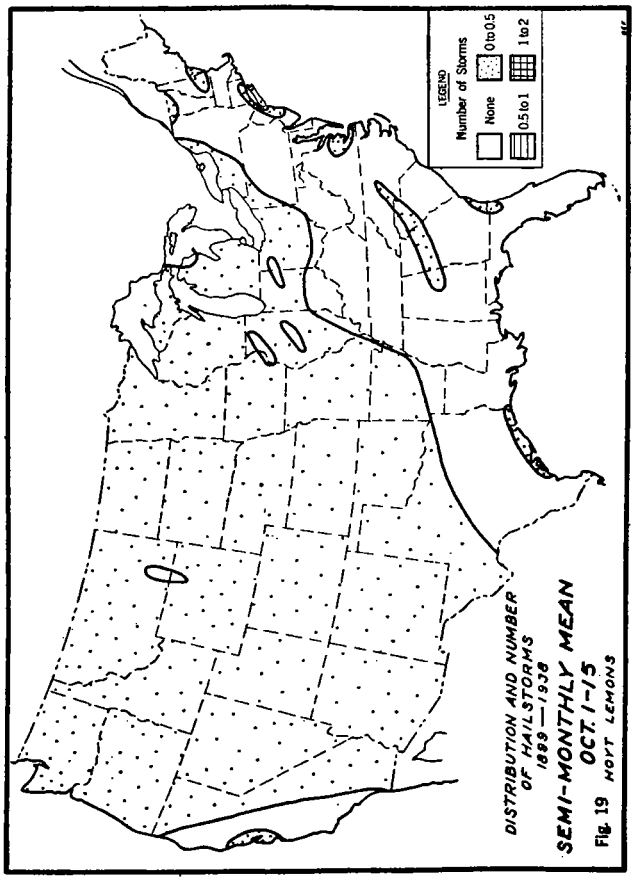

LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN
JULY 1-15
Fig. 13 HOYT LEMONS

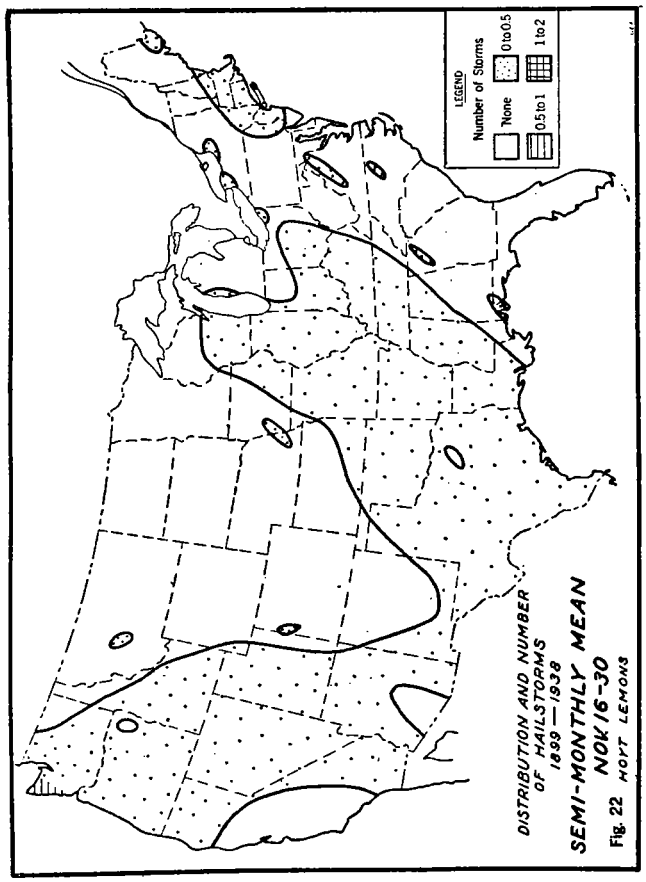

LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN
AUG. 1-15
Fig. 15 HOYT LEMONS

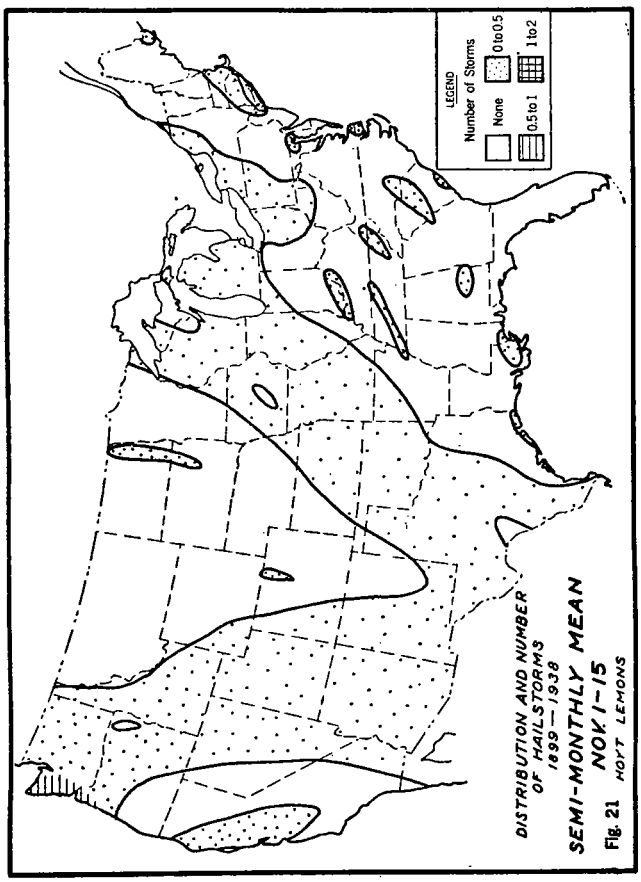

LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN SEPT. 16-30
Fig. 18 HOYT LEMONS

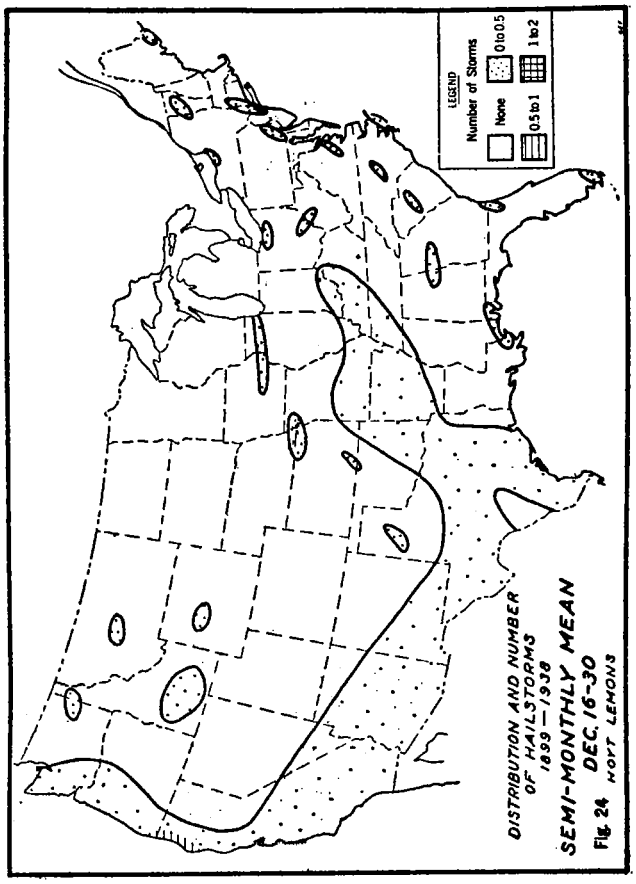

LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN OCT. 16-30
Fig. 20 HOYT LEMONS

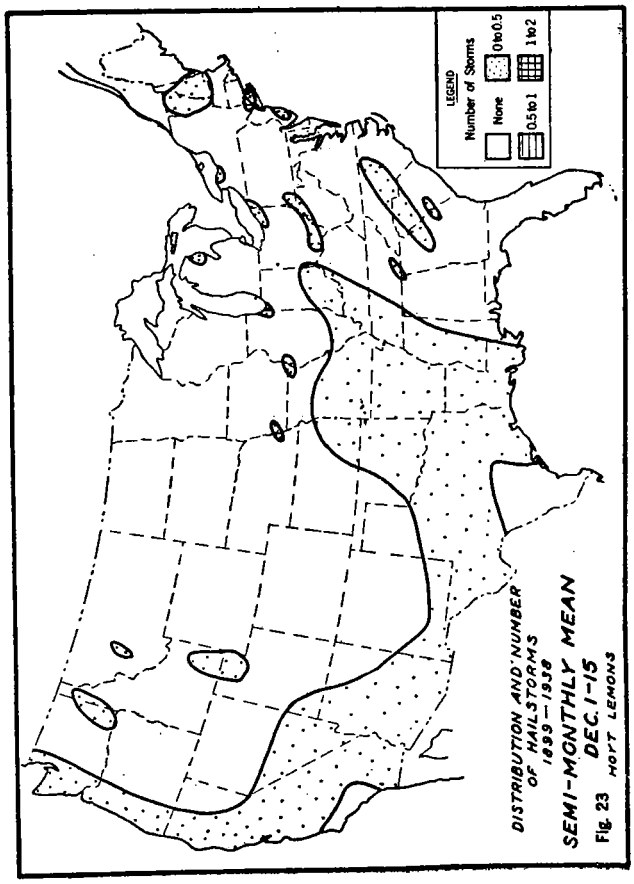

LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN SEPT. 1-15
Fig. 17 HOYT LEMONS


LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN OCT. 1-15
Fig. 19 HOYT LEMONS


LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN NOV 16-30
Fig. 22 HOYT LEMONS


LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN NOV 1-15
Fig. 21 HOYT LEMONS


LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN DEC. 16-30
Fig. 24 HOYT LEMONS


LEGEND
Number of Storms
None
0 to 0.5
0.5 to 1
1 to 2
DISTRIBUTION AND NUMBER OF HAILSTORMS 1899—1938
SEMI-MONTHLY MEAN DEC. 1-15
Fig. 23 HOYT LEMONS

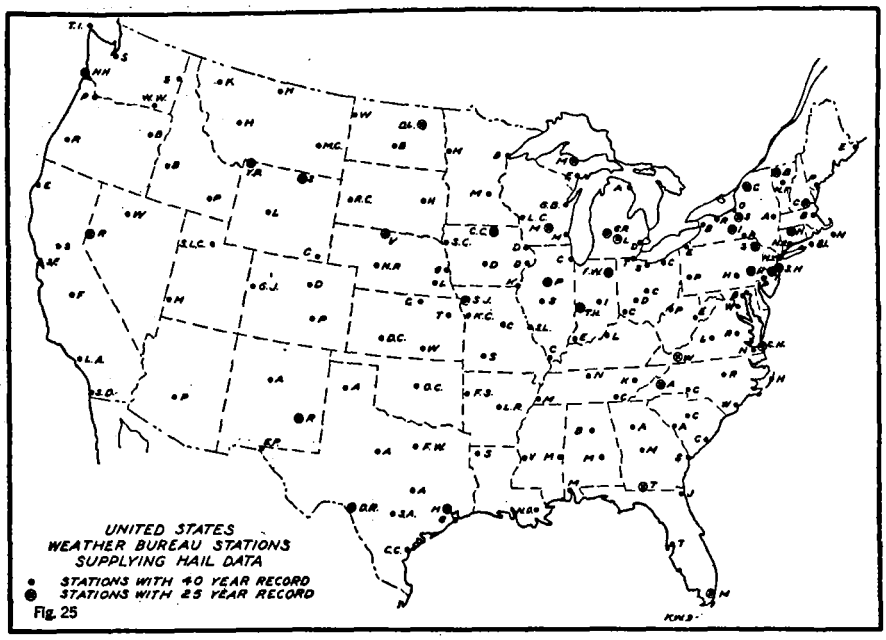


Fig. 25

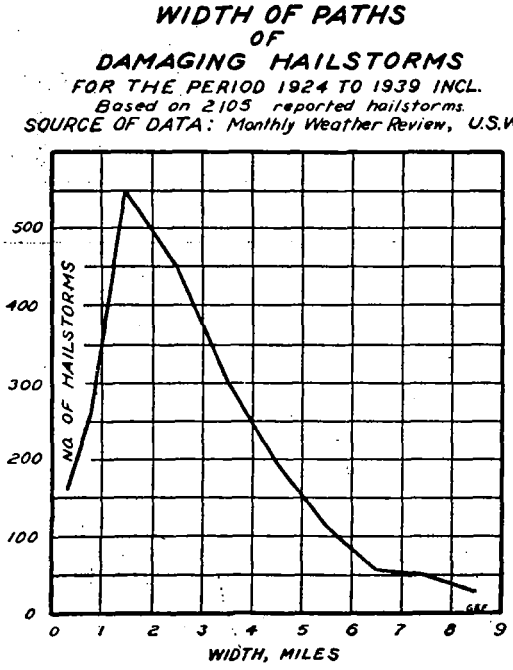


Fig. 26

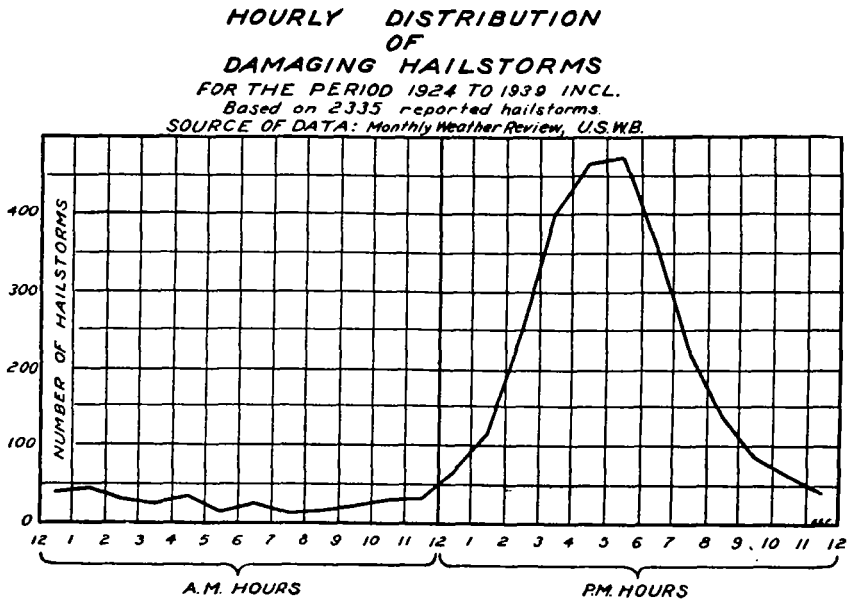


Fig. 27