

Degree Days in Indiana

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Several sources reveal some general aspect of degree days in Indiana, but none utilize statistics available in recent years as more stations submitted information on which more detailed work could be based. This study is part of a continuing interest in degree day factors in the hopes that its fuller meaning will eventually end in a more definitive value, an ecological implication, or an engineering value more worthy of use. In this study, deviations and extremes are emphasized as well as means.

In this study, 49 stations showed sufficiently continuous records to warrant their inclusion. Approximately another hundred stations had inadequate records and were used as supporting sources but not conclusive sources of information. A number of maps were prepared to show the distribution of degree days; by month, by season, and for the year.

Annual Degree Days

From north to south the average annual degree day average is about 2600. As one might expect, stations in the northern tier of counties experience up to about 6400 degree days and the southern tier about 3800 degree days. Isolines of 500 degree days are fairly evenly spaced until the southern third of the state where changes occur more rapidly.

A close view reveals that degree values can change rapidly within short distances although this fact doesn't show up on the map. The difference in annual averages between Evansville and Evansville airport is about 500. A similar situation prevails in the Indianapolis station and the airport nearby. Porter County has a pattern also which reveals a marked difference between a littoral station and an inland station.

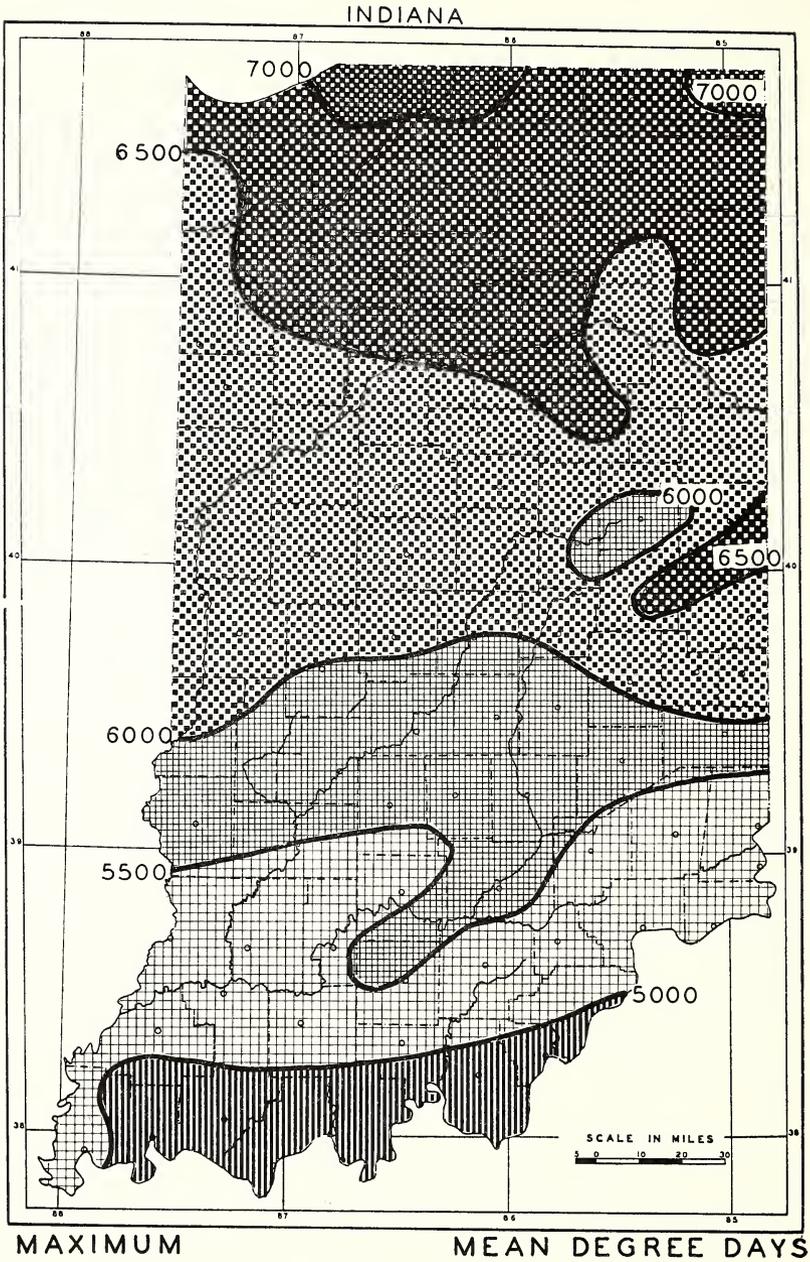
A map (map I.) showing maximum record occurrences reveals around 7000 in the north and 5000 in the south. This generally represents about 1000 more degree days than average for most stations. Although this is a flexible figure in actual degree days, percentage-wise it is far more uniform. Even in closely related stations the percentage remains nearly constant or about ten per cent.

When minimum records were examined, it was found that the differences between average conditions and minimum were about 500 to 800 degree days. The deviations were not as great in the north as in the south.

Heating engineers generally recommend the use of electricity for heating homes when about 5000 degree days or less are experienced. If this is true, then a large share of Indiana is not in the preferred electric heating belt.

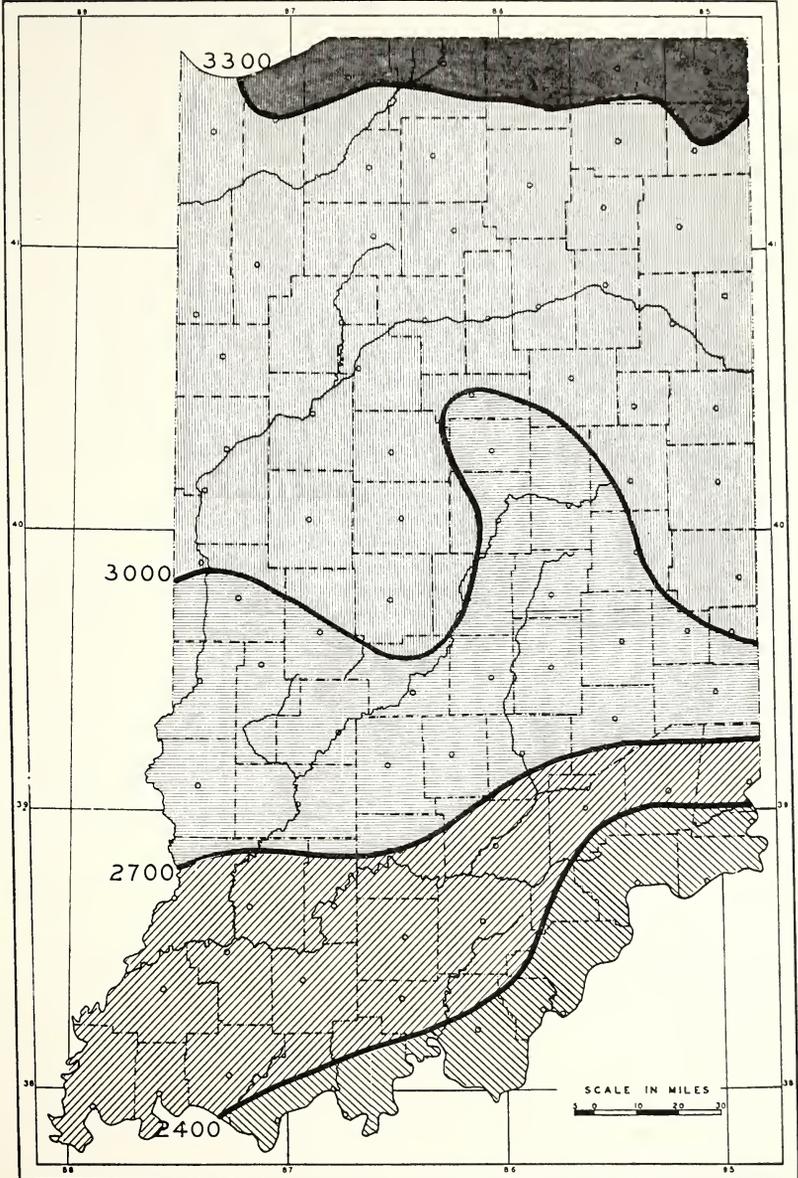
Seasonal Distribution of Degree Days as Shown by Map II

Winter patterns are illustrated because about 60% of the degree days occur in winter months. Percentages reveal more degree days in the southern portion than in the northern portion. The extreme of 3300



Map 1

INDIANA



WINTER

MEAN DEGREE DAYS

Map 2

is found in the north but about 2400 in the southern stations. Isolines indicate uniform change from north to south but as on previous observations, the change takes place more rapidly in the south.

Spring has about 300 more degree days than fall and about 25% of the total of the year. This varies from about 22% in the north to about 35% in the south. There are about 1500 degree days in Spring in the north and about 900 in the south. One comment here should note the relationship between stations on Lake Michigan shores and inland stations. The Spring records imply a continuation of cold influences to increase the degree day accumulation but at all other seasons, the littoral location seems to create a reduction in degree days.

Fall ranks as the third season in total number of degree days. About 1200 in the north and about 900 in the south. It is the most uniform over the state. The values are relatively even. One interesting point is nearly all the stations are uniformly close to 900 with the exception of Jeffersonville with a total of 674 degree days.

Summer has few degree days but no station of the 49 has absolutely none.

Monthly Distribution of Degree Days

Most statistical summaries of degree days, such as that put out by the American Petroleum Institute, generally ignore the warm months. Therefore, this study does not include the maps for June, July and August, although the statistics for the three months are included in the annual averages.

September has few degree days, and they vary from 25 in the south to slightly more than 100 in the north. Stations along Lake Michigan have less than inland surrounding stations. Several stations in the central part of the state had above average amounts for the region.

October has from 200 to 300 degree days. The state-wide picture is uniformity, however. Evansville had 199 and Waterloo 377, but changes were not abrupt from one area to another.

November finds greater contrast and with a low of 542 to a high of 788. Changes are not abrupt. Lake stations show up well and the isolines are well distributed.

December is the second coldest month as represented by degree days. The lake still is a reducing factor. Between a lake station and a station a few miles inland is 50 to 150 degree days. Jeffersonville has 789 and South Bend 1116. Nearly two-thirds of the state experiences about 1000 degree days.

January is the coldest month. Jeffersonville experiences 868 and there are 1237 in South Bend. The largest share of the state experiences between 1100 and 1200.

February is the third coldest month and is only slightly warmer than December. Most stations run about 100 degree days less than December and 200 less than January. Most of the area of the state records between 800 and 1000 degree days.

A warming trend goes on slowly and March is slightly warmer than February. The lake influence is gone. Evansville records 573 and

South Bend 946. Most of the state has less than 700 degree days. Most stations have a hundred less than February.

April warms up rapidly. The number is about half that of March. Evansville is down to 219 and South Bend 492. Most of the state has between 300 and 500 degree days.

May is the last month analyzed. Northern stations have slightly over 200 and most southern stations have between 50 and 100. The transition from north to south is gradual.

Summary

Although the statistics used are of short duration, they are complete within the period. The probability is that the pattern of distribution is well established and only the quantity might change with further work.

The persistent problem of region generalization versus microclimates constantly appears. It would seem that for any precise reason that the individual station nearest would reveal the essential deviations that have to be known if the application of degree day information is to be worthwhile. The three stations utilized by the American Petroleum Industry reveal little value except for the three stations. If the total degree days are to be utilized in determining fuel costs, state-wide generalizations are of little value.

Intriguing, but unanswered is the paradox of December being the second coldest month but Spring the second coldest season.

Degree day variabilities increase from north to south and especially in winter.

Valley, shore and suburban locations show marked contrasts to their opposites.

As we proceed southward, the percentage of degree days in the winter months increases. Like other state pictures as a whole, Fall and Spring quantities decrease but remains in their relative position for the entire year.