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TERMITE DISTRIBUTION IN MICHIGAN[1]

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Subterranean termites have been present in Michigan for a long time. They were reported as being destructive to buildings in 1920 (Anonymous, 1961), and apparently damage done at that time was increasing over what had occurred earlier. Notwithstanding this long time presence of termites in the state a majority of the population still looks upon the termite as a strange insect most likely to be encountered in the South. All too many home owners and building proprietors as well as others are unacquainted with presence of termites in their areas. At the same time monetary loss due to termite attack is considerable. As an example, control costs and losses to structures in Tennessee due to termites in 1971 were reported (Anonymous, 1972) as over $8 million. Expenditures are less than this in Michigan but still substantial. Because of these facts it was felt that a wide cross-section of the public would benefit from knowledge of locations in Michigan where termites are present and most likely to cause damage. Unfortunately the general public is not aware that there are effective control methods to prevent damage where termites are a hazard.

Reticulitermes flavipes (Kollar) is the most commonly encountered termite in Michigan. Other species found in the State are *Reticulitermes arenincola* Goellner and *R. tibialis* Banks. *Areninocola* is reported from the very southwest corner of the State and *R. tibialis* is known from scattered localities.

SPREAD OF TERMITES

One of the first questions asked by the public in regard to termite activity is, "How did they get here?" I doubt that anyone can say for sure just where or when they entered Michigan. They may have been in the Lake States area since prehistoric times. The likelihood is that they moved northward from the South. Even now there is evidence that termites are moving farther north, or at least damage is appearing in colder locations. The records, in this respect, for Michigan are skimpy but we can look at other areas in the United States and Canada and apply the observations here.

Subterranean termites have been found (Anonymous,, 1968) in Roundup, Ryegate, Billings, Livingston and Ekalaka, Montana. All of these places are farther north than Alpena. Going even farther north, observers (Anonymous, 1961) have found an office building in Superior, Wisconsin, infested and in North Dakota (Anonymous, 1963) termites have been found in east central McKenzie County which is at a latitude of about 48° north. This is farther north than any point in Michigan other than Isle Royale. Figure 1 shows the approximate locations of these infestations. Thus, geographical location is not a safeguard in this state; at least its northerly location is not.

How did these insects get into places like Superior, Wisconsin, and Toronto and Kincardine, Ontario, when they are not known for a hundred miles around? In these cases it is likely that they were brought into these cities on wood or soil. In Toronto the first indication of termite activity was along the waterfront (Urquhart, 1953) while in Kincardine termites were first found in some debris along the railroad-harbor terminal.

What happens after termites become established at a new location? The infestation in Toronto spread rapidly. In less than 25 years termites were found several miles from the original infestation and in most sections of the city and several suburbs. On the other hand the spread of termites in Sheboygan, Wisconsin has been much slower. Fully satisfactory explanations for this difference are lacking.

They can then extend their range by mating flights when winds might carry them as much as a mile from their original habitation. A third way is through tunnels in the soil.

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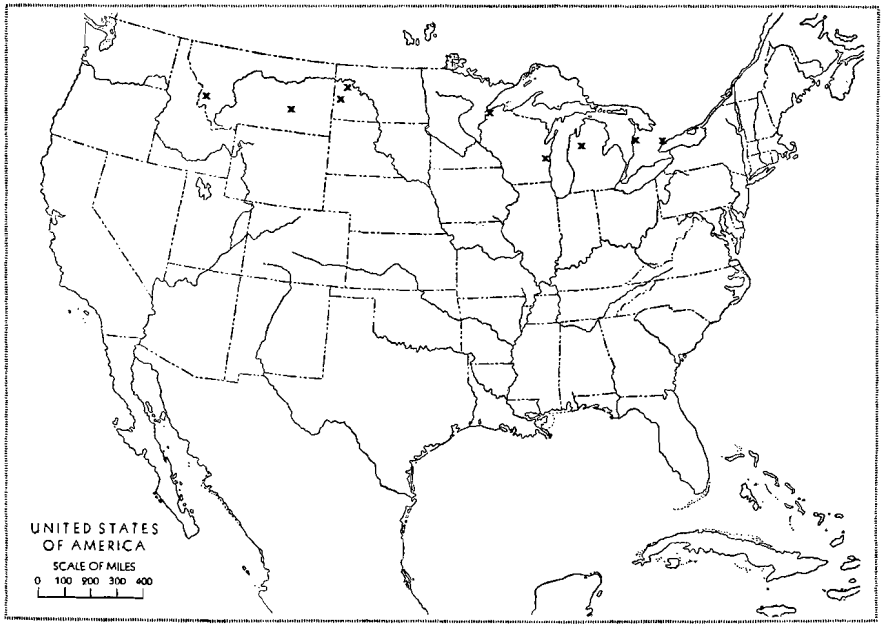

Fig. 1. Northerly locations of documented subterranean termite infestations of buildings in Montana, North Dakota, Wisconsin, Michigan and Ontario.

Maps of infested areas of the two Ontario cities indicate that both of these pathways are involved. No detailed studies of this kind have been made in Michigan but it is a safe bet that related patterns would be found.

SOURCES OF INFORMATION

The State of Michigan is in a fringe area as far as termite distribution is concerned. States to the south would have termites in all counties but here termites in many counties are still rare or nonexistent at present, much to the relief of homeowners. On the other hand they increase in numbers toward neighboring states to the south. These intermediate areas are of most interest because it is here where builders and homeowners have to decide whether they want to spend money for termite protection or not. In heavily infested areas the question is already answered for them.

There are several approaches to locating termite activity. Bait stakes can be buried in soil throughout the area for examination in six months to a year. This scheme was followed in southern Ontario (Kirby, 1965) some years ago when 1200 stakes were set in soil from Toronto to Hamilton and then over to Sarnia. Only stakes in Toronto became infested. This approach is somewhat costly, time consuming, and samples only a very small portion of large areas. In addition plain wood stakes seem to be unattacked by small colonies in the vicinity. Bait stakes with attractant are best for use in a city or small area to pinpoint trouble spots as was done in Kincardine (Gray, 1969). This procedure should prove to be a useful tool in Michigan if used in a similar way but was not adopted for this statewide survey.

Pest control operators were deemed to be the best source of information because they encounter termites in their day to day activities. They were suggested by entomologists, real estate boards and governmental housing agencies. Accordingly, termite control companies were the chief source of information on which this study was based.

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In consultation with the National Pest Control Association a questionnaire was composed that was sent to all members in Michigan, northern Indiana and northern Ohio. a 51% response was obtained. Personal interviews were also held with most of the larger firms in the termite business in Michigan. County extension directors, building officials, and district foresters in Michigan were sent other questionnaires.

Response of building officials was also quite gratifying as far as percentage of returns was concerned; 108 of 219 or 49% replied. However, a considerable proportion disqualified themselves because they did not perform inspections of older houses. Estimates of percentage of termite infested buildings by building officials did not always agree with those of the TCO (Termite Control Operators). The general pattern of termite distribution as reported by them, however, confirmed TCO's observations in many counties.

The mailing to TCO's asked how many termite jobs per year for the past five years were carried out. County Extension Directors were asked how many inquiries on termites they had received in the last five years. Obviously these are not the same, but inquiries are an indication, in large part, of termite activity in a county. Information from the two sources agreed quite well.

COUNTY TERMITE ACTIVITY

Table 1 lists counties in Michigan from which subterranean termite activity has been reported and includes an estimate of percentage of infested buildings. Those counties which were reported to have had but a few cases of termite attack or observation in the last five years are so designated. If there is a blank in the "activity" column there was no attack reported. These would be border counties next to termite-free counties.

A few explanations are in order for some counties. Genesee reported virtually no termite activity by TCO's but a building official in a township bordering on Flint noted that a number of substandard dwellings with very low foundations built in 1935 or thereabouts had been infested with termites. Grand Traverse was cited as having had one case of termite infestation in a lumber company storage warehouse that was heated. This infestation was eliminated and there has apparently been no reinfestation. Gratiot County was not mentioned by any TCO contacted or the county extension director as having termites but St. Louis, Michigan, was listed by a building official as having some infested houses.

Ingham County lies between Eaton and Livingston both of which have termites; however, it is reported to have but few instances of termite infestation of buildings. Over the years a few control jobs have been done in Lansing and East Lansing. The district forester reported termite presence in a woods near Stockbridge. A large swarm from an extensive infestation was reported on March 22, 1971, in Lansing (Anonymous, 1971) so the threat is there.

It is generally agreed among TCO's that thumb counties, Huron, Tuscola, Sanilac, Lapeer, and Saint Clair have very little termite activity. Macomb is also surprising because it borders on Lake Saint Clair, has a milder climate, is next to counties that do have infestation, but still is reported to have very few termites.

Counties omitted from Table 1 were not designated by any of the groups queried as having termite activity. These were all of the Upper Peninsula and those in the northeastern part of the Lower Peninsula as well as Clinton, Shiawassee, Saginaw and Bay. Figure 2 is a map of Michigan with counties shaded to show estimated percent of buildings infested in the county. Figure 3 illustrates termite distribution-intensity information by use of lines of equal intensity in an attempt to show graduations better. Neither of these maps can be precise but they do give a balanced estimate. Someone in Kent or Kalamazoo County, for example, should be wary of termite attack, and be informed if he is building or buying houses or other buildings containing wood, wallboard, hardboard, particle board and the like. No doubt there will be those who object to estimates allotted to a county compared to their own experience. I acknowledge that these are estimates based on observations of many people, and there may be some not contacted who have more precise information. It would also be interesting,

Table 1. Termite activity in Michigan by county. Counties not listed have no termites.

County	Activity Reported By		TCO Estimated % Infested Buildings	CED Inquiries Per 10,000 Population
	TCO	CED or BO		
Allegan	x	x	15	Many
Barry	x	x	10	14
Benzie		@	–	14
Berrien	x	x	>20	3
Branch	x	x	7	28
Calhoun	x	x	8	4
Cass	x	x	20	–
Eaton	x	x	3	.6
Genesee	@	x	<1	1
Grand Traverse	@	@	0	.3
Gratiot	–	@	0	0
Hillsdale	x	x	4	21
Ingham	@	@	<1	0
Ionia	x	x	5	11
Jackson	x	x	3	5
Kalamazoo	x	x	10	18
Kalkaska	@	@	–	0
Kent	x	x	12	25
Lake	x	x	5	48
Lapeer	@	@	<1	.4
Lenawee	x	x	2	.5
Livingston	x	x	2	22
Macomb	x	@	<1	–
Manistee	x	x	3	4
Mason	x	x	6	7
Mecosta	–	@	0	13
Monroe	x	x	3	21
Montcalm	x	x	3	5
Muskegon	x	x	14	32
Newaygo	x	x	7	36
Oakland	x	x	<1	–
Oceana	x	x	8	7
Ottawa	x	x	15	63
St. Joseph	x	x	10	22
Tuscola	–	@	0	.4
Van Buren	x	x	>20	27
Washtenaw	x	x	2	.1
Wayne	x	x	1	.9
Wexford	x	x	4	3

BO = Building Official
TCO = Termite Control Operator
CED = County Extension Director
x = Positive
@ = Rare or Minimal
– = Not reported

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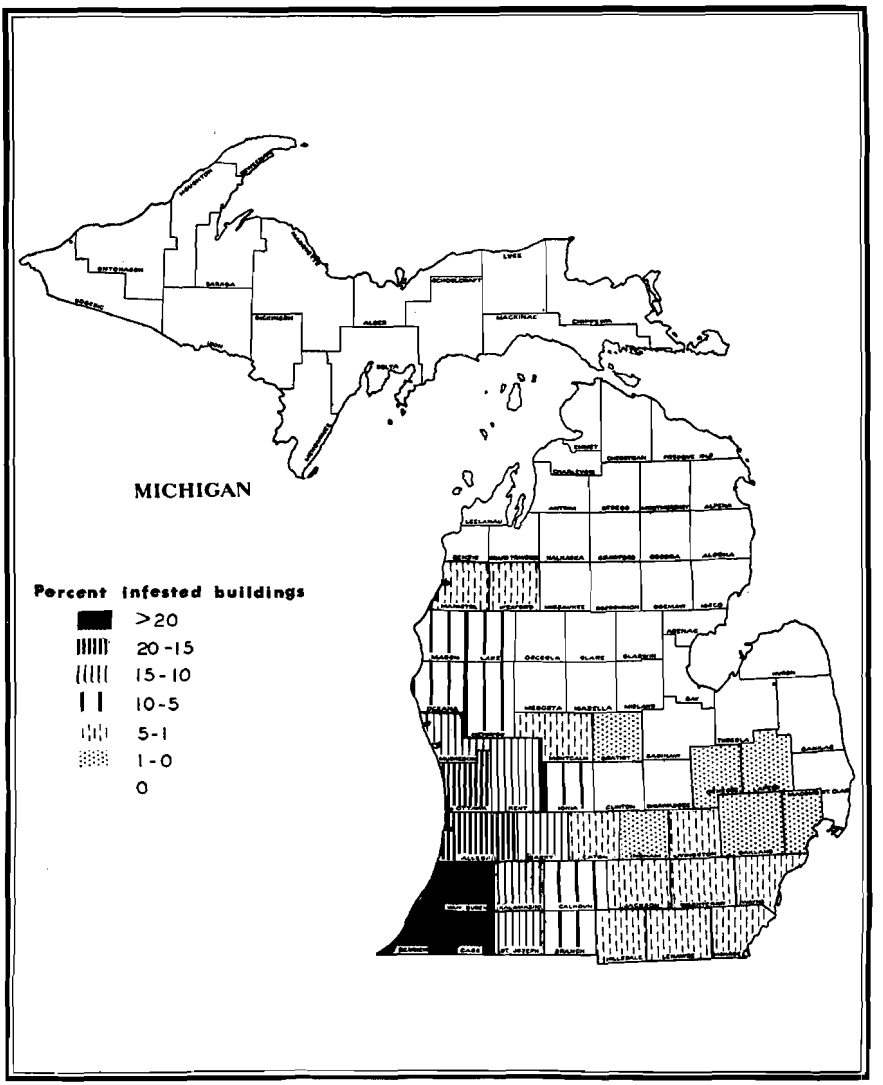

Fig. 2. Termite infestation in Michigan by county.

useful and informative to study certain areas, counties, parts of counties or cities with bait stakes to pinpoint termite presence and rate of spread.

One reason data shown may not agree with an observer's information is that termite infestation can vary greatly within a county or city. Values shown are averages. There may be some streets or blocks where infestation is almost 100% while in other parts of town there are no known termite infestations. This was closely studied at Kincardine (Gray, 1969). While no such intensive study has been made in Michigan, some observations illustrate a related situation. For example, in Oakland County termites are

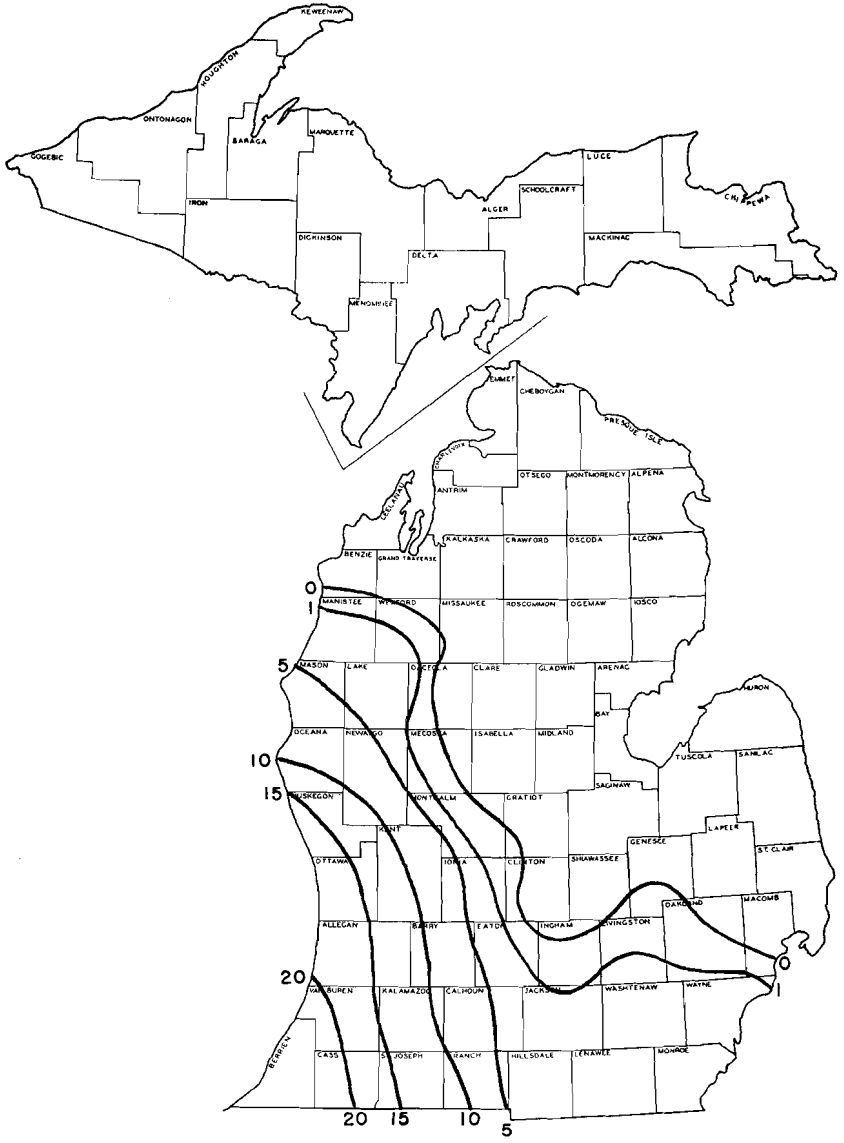

Fig. 3. Termite infestation in Michigan by lines of equal frequency of building attack.

active near Walled Lake, Duck Lake, Ann Lake, Union Lake, White Lake, and in the southern part of the county along 8 Mile Road. Some of these places are shown on the map, Figure 4.

In Wayne County probably less than one percent of the buildings are infested on the far east side; however, infestation is increasing in the western part in Taylor, Wayne, Westland and Redford, but is still under 5% in these sections. Figure 5 designates some

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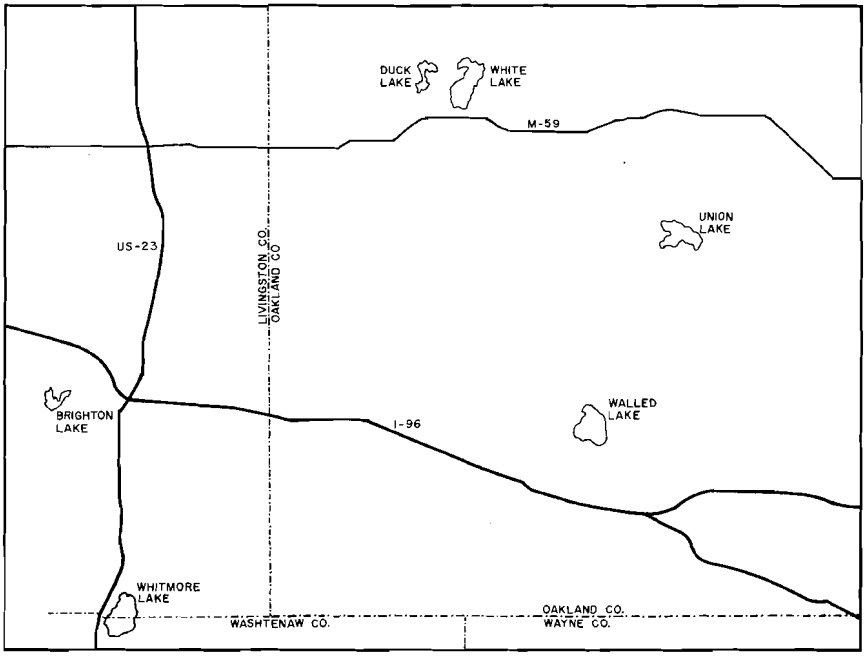

Fig. 4. Lakes in Oakland and adjacent counties which have heavy termite infestations nearby.

locations of termite infestation in the Detroit area. No doubt there are other areas of infestation and a prediction is made that these infestations will increase until they touch and become one large region.

Observations in and around Grand Rapids indicate that heavist infestations are to the southeast and would include Cascade and Kentwood. Next is the southwest quadrant with Wyoming, Grandville and Jenison all being fairly heavily infested. Then come northeast and northwest. Figure 6 shows these divisions of termite incidence.

In counties where termite infestation is more general such as Kalamazoo, Van Buren, Cass, etc. damage can be found in nearly every town and in rural situations as well. Figure 7 shows the area around Kalamazoo with many towns underlined. All thus marked were locations where one TCO had several buildings under contract for treatment. If contracts of other TCO's for the same area were known, it is likely that every town on this map would be underlined.

INFLUENCES ON TERMITE DISTRIBUTION AND ACTIVITY

The more important environmental influences on subterranean termite distribution are mentioned here.

Moisture is certainly important. These insects need an ample supply for their metabolic and structural and destructive activities. They obtain water they need from the soil although there are instances where colonies were established on barges or vessels with no soil present. Moisture enters soil from precipitation, surface runoff and subsoil drainage. Influence of moisture is seen especially in areas of sparser termite infestation such as in Livingston or Oakland Counties where active locations are near lakes. Another is in the city of Otsego where 70% of the buildings are reported to be infested. This high incidence is attributed in part to a high water table and heavy rainfall.

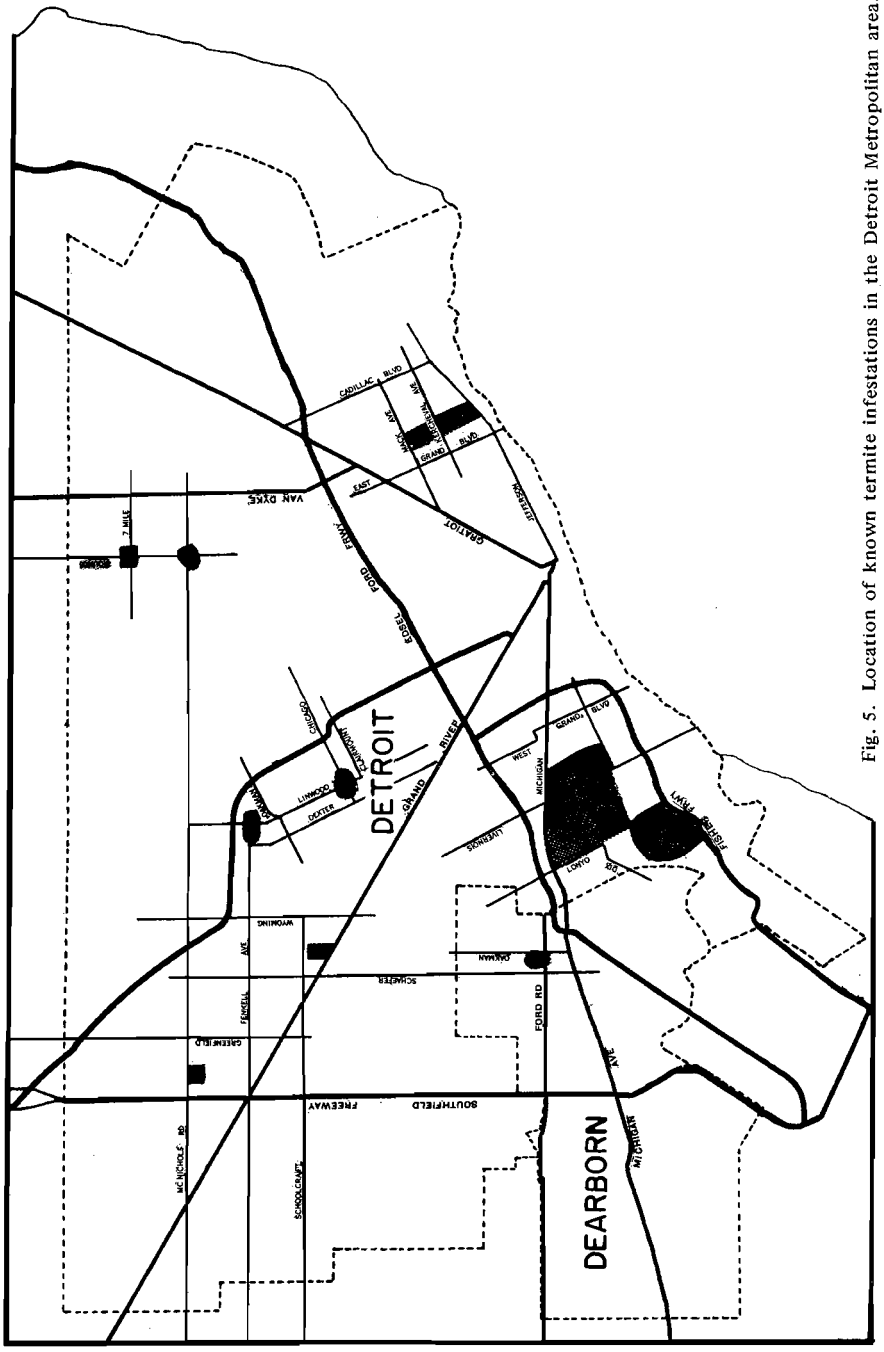

Fig. 5. Location of known termite infestations in the Detroit Metropolitan area.

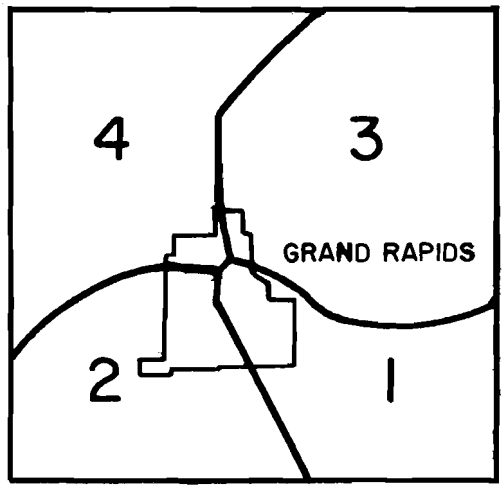

Fig. 6. Severity of termite infestations in the Grand Rapids area. 1 = highest, 4 = lowest.

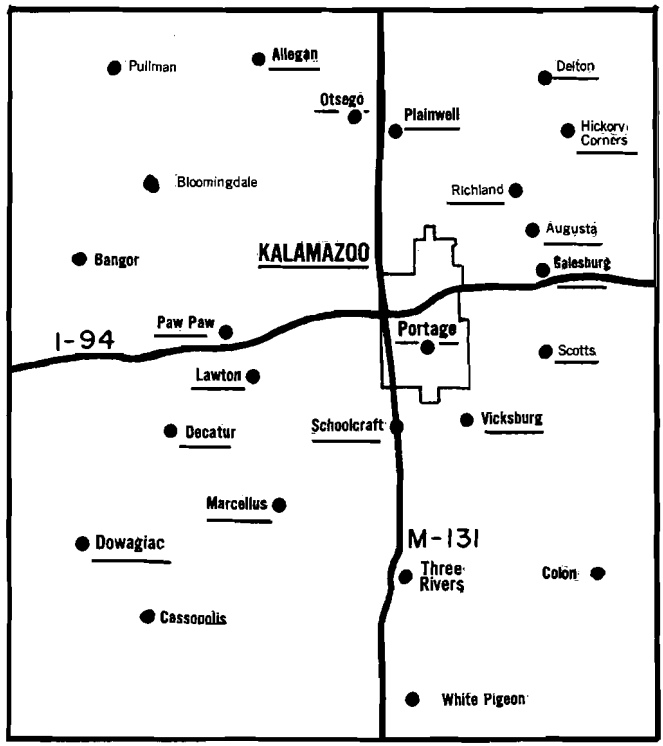

Fig. 7. Towns in Kalamazoo area in which one TCO has contracts for termite control in buildings (underlined).

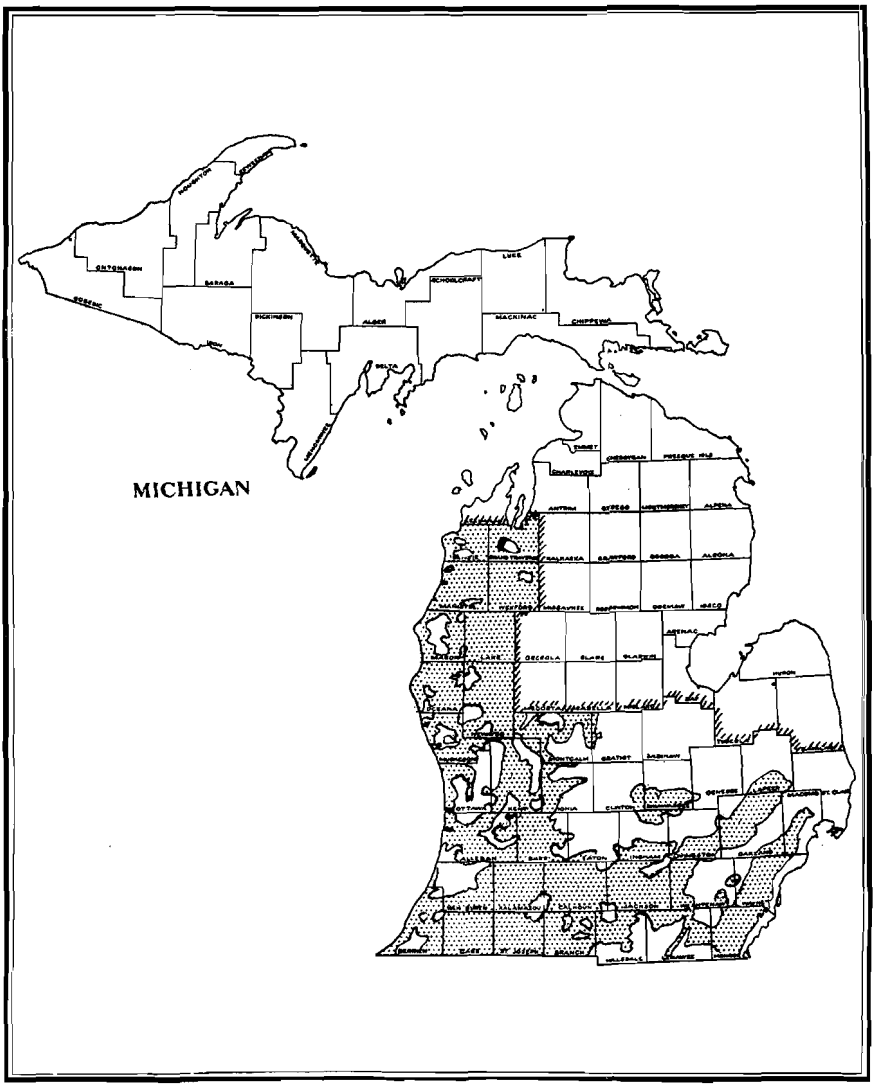

Fig. 8. Areas within the designated section of the State of Michigan with sandy, loamy sand, and sandy loam soils. (Based on Whiteside's map.)

Soil type is important. According to Kofoid (1934) *Reticulitermes* prefer sandy soil over clay soil by a wide margin. Mechanical structure and water holding capacity are also of interest. Apparently even less water is needed in sandy soil for ready excavation by *R. hesperus* than in sandy loam. This preference of some termites for sandy soils can be seen in Michigan. Most counties with the greatest frequency of termite infestation are those with some of this type of soil including Oceana, Newaygo, Muskegon, Kent, Ottawa, Allegan, Van Buren, Berrien, and Cass. Soils of Barry, Kalamazoo, Calhoun, and St. Joseph are largely sandy loams but still apparently sandy enough to encourage considerable termite activity. Figure 8 is a map of Michigan with areas in the southern and

western regions marked to show sandy and sandy loam soils. This map is based on soil associations in the bulletin by Whiteside et al (1968).

Latitude is sometimes cited as a limiting influence on termites. This is closely linked with temperature. Low temperature is limiting, but subterranean termites can survive in an intolerably cold climate if they are warmed by artificial heat of a building escaping to the surrounding soil. Esenther (1961) found that termites could survive subfreezing temperatures in the 20-25°F range during observations in Janesville and Sheboygan, Wisconsin. There were no buildings within a quarter mile of these observed insects. As was cited earlier, subterranean termites have been found in Montana and North Dakota which have a colder soil temperature than Michigan. Thus, latitude is probably less important than resulting temperature from escaped heat into soil. It is also an indication that outdoor temperature is not a safe limiting condition in Michigan for termite attack in heated buildings.

Food is a prime requirement and not very limiting to termite distribution because cellulose is so widespread that there is hardly a place where it is not found in some form. Life is made easier for termites by inadvertent and careless acts of man. There is no point in dwelling on such careless acts as burying wood debris around new houses and other buildings. It is well known that this leads to termite infestation and most cities and communities have codes outlawing the practice, but how stringently is the code enforced? As subdivisions continue to be built in old orchards without enough attention paid to destruction of stumps and old branches termite infestation will be encouraged. In Michigan another source of wood is leftover from lumbering days of the '90's. The high incidence of termite infestation in the Muskegon area is attributed in large measure to huge amounts of old white pine sawdust that was used for fill. Cadillac is another city that owes infestation, in part, to the plentiful supply of sawdust and wood residue left after lumbering days.

Besides moisture, soil, temperature, and food sources there are other factors that determine termite distribution. Only one of these, the presence of natural or man-made barriers, is discussed here. The water barrier of the Great Lakes and connecting rivers has probably limited access of termites to southern Ontario. That is to say without the presence of all this water termites would be more widespread in this part of Canada. At Kincardine a river and a state highway were barriers which kept termites from spreading to other parts of town. This can be seen from Figure 9 taken from the late Mr. Gray's fine article. Likewise termite spread to the upper peninsula may eventually be contingent on their ability to get across the Straits of Mackinac, although they would not be so barred on the west side of Lake Michigan.

NATURE AND EXTENT OF DAMAGE AND INFESTATION

The Federal Housing Administration has taken steps to control termite infestations by requiring inspection of structures before they can be sold. These inspections are made by TCO's and they are also made for real estate boards where a property is sold under non-FHA supervision. Counties in which FHA requires such certification are: Lenawee, Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne, in the southeastern part of the state and Allegan, Barry, Berrien, Branch, Calhoun, Cass, Hillsdale, Ionia, Jackson, Kalamazoo, Kent, Muskegon, Ottawa, St. Joseph, and Van Buren in the southwestern part. These counties are shown on Figure 10. This figure should be compared to Figures 2 and 3.

In more heavily infested counties of Michigan pre-treatment of structures with insecticides is practiced, see Figures 2 and 3. Like any other preventive treatment it must be carried out thoroughly to be effective. Unreasonably low bids for such work are cause for suspicion. Inspection after application is diminished in value because there are no simple field methods of quantitative estimation of the chemicals used.

An estimate based on TCO response taking into consideration percentage and size of the firms would indicate somewhere between 7,000 and 8,000 structures are treated per year in Michigan at an average cost of $225. This does not include pre-treatment work. Thus, about $1,600,000 is spent per year for remedial termite protection at present and very likely will increase.

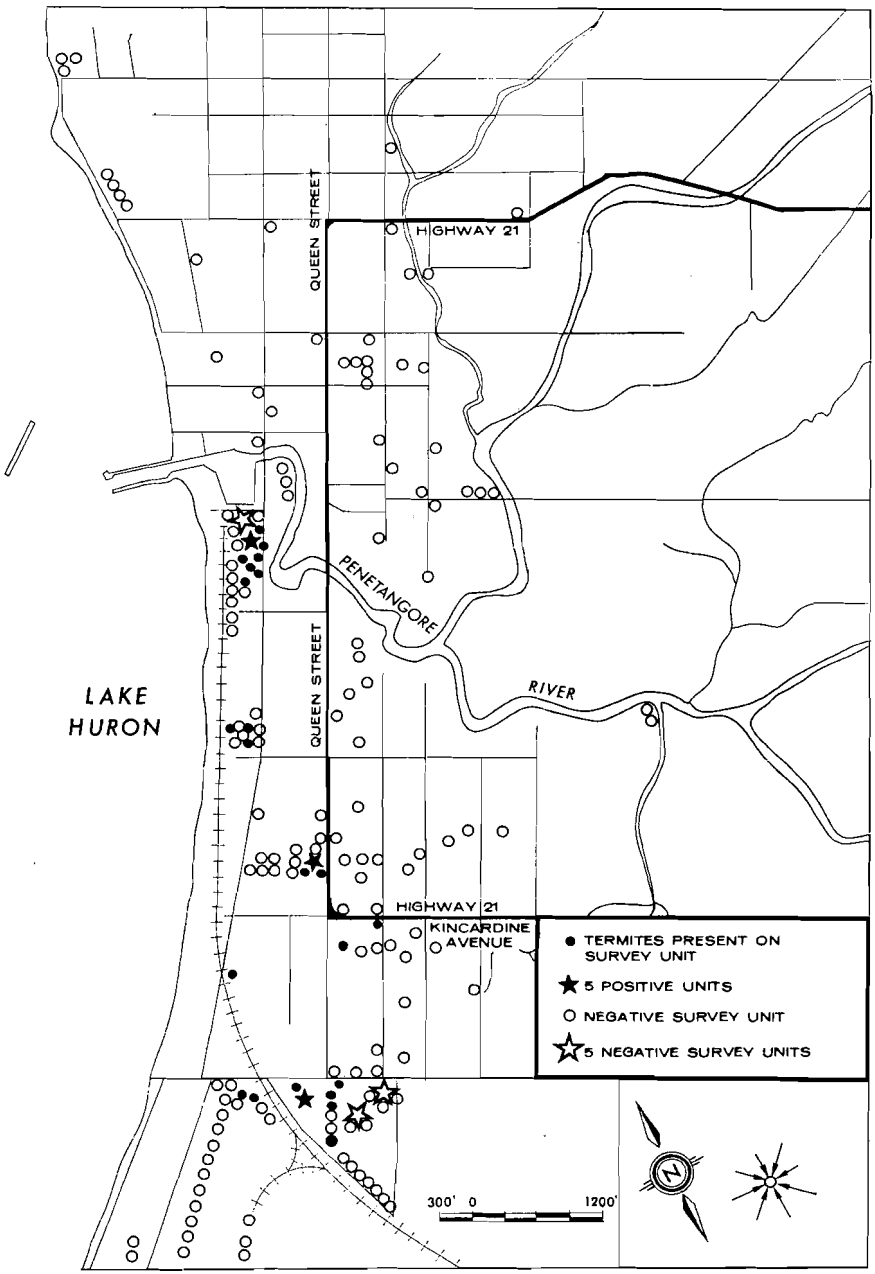

Fig. 9. Distribution of subterranean termites in Kincardine, Ontario, Canada in 1968-1969. From Gray's 1969 paper.

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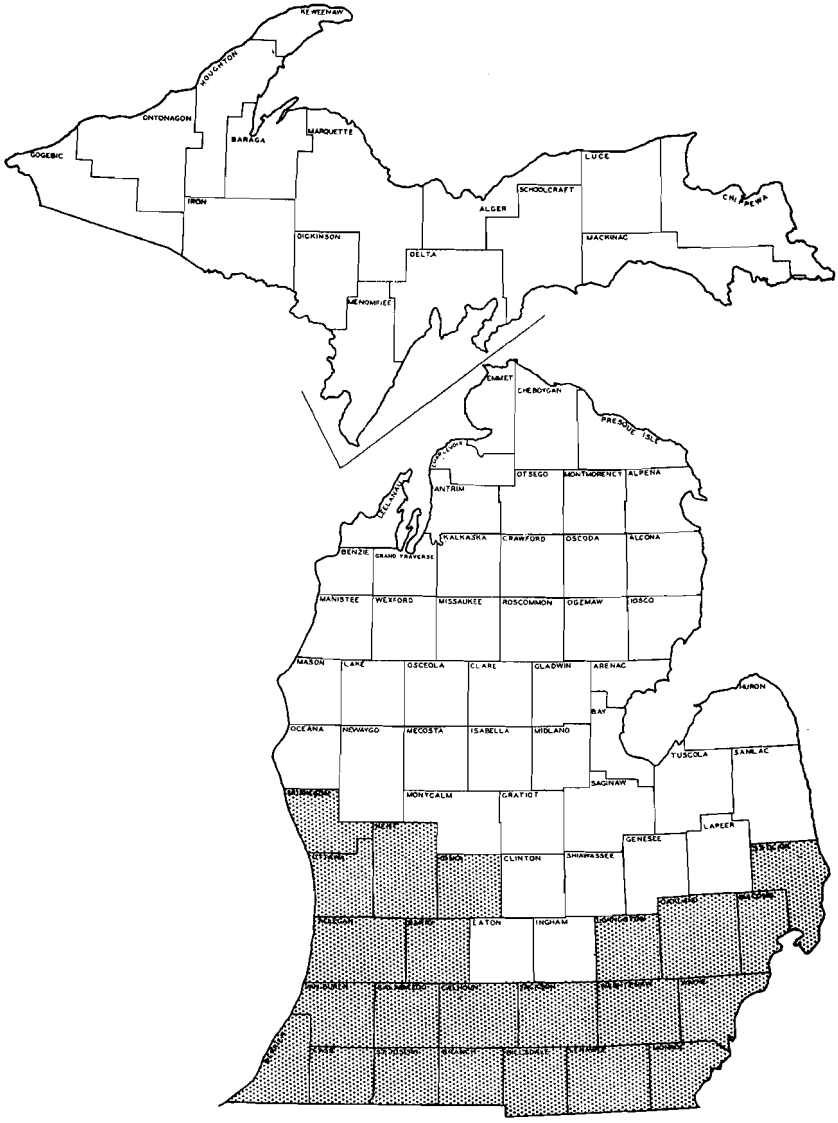

Fig. 10. Counties in Michigan where the Federal Housing Authority requires certification for freedom from termites before a sale can be made.

A listing of structures or objects reported as being infested with termites follows: houses, office buildings, stores, motels, industrial buildings, park shelters and pavilions, churches, schools, summer cottages, farm buildings, fences, hardwood sawdust piles, stored lumber and timbers, fallen trees and logs, stored firewood, and tree stumps.

One of the questions asked was whether incidence of termite infestation was increasing, decreasing or remaining steady. More than 70% of the TCO's believe it is

increasing. Some of this may be more awareness of the problem on the part of the public, but more treatments in counties where a few years ago there were few or none is a sign of increase.

To sum up, termites are here to stay in Michigan. They are confined to the lower peninsula and reach their greatest activity in the southwestern counties. They may be concentrated in a few places in some counties while present in nearly every town and wooded area in others. Sandy soils and shore areas are especially to their liking. Heated buildings and basements make termite establishment possible almost any place in Michigan. Termite infestation appears to be increasing in the state. It behooves homeowners, builders, government officials, real estate people and, of course, termite control operators to be familiar with the problem and its control.

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