Geological Survey
Division

Report on

MICHIGAN PEAT RESERVES

by

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UNEDITED DRAFT

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MICHIGAN PEAT RESERVES

Michigan's reserve of air-dried peat is estimated to be 539 million short tons. Eighty percent or 431 million short tons of the reserves are believed to be located in Michigan's Northern Peninsula. In terms of calorific value these reserves would be equivalent to 269.5 million short tons of bituminous coal.

DEFINITIONS

1) Organic Soil: Soil containing 20 to 30 percent or more organic matter one foot or more in depth. Peat and Muck are the two types of organic soils. (Davis & Lucas, 1959 p.5).

2) Muck: An organic soil containing 30 percent or greater mineral soil. (Soper & Osbon, 1922, p.17).

3) Peat: An organic soil containing less than 30 percent mineral soil. (Soper & Osbon, 1922 p.17).

4) Peat fuel: Peat with ash (inorganic) content of 20 percent or less. (Soper & Osbon, 1922, p.18).

5) Comparative calorific values of peat and other fuels (Soper & Osbon, 1922, p.18).

Fuel	British Thermal Units
Wood	5,760
Air-dried machine peat	6,840
Lignite	7,500
Bituminous coal	14,000
Anthracite	13,000

ESTIMATION OF RESERVES

Reserve estimates were obtained utilizing the following information:

1) Occurrence and distribution of Greenwood peat and Spalding peat as mapped and published in county soil surveys.

2) Extrapolation of percent area Greenwood peat and Spalding peat of organic (peat & muck) type soils from known counties, 69, to entire state; 83 counties. (Davis & Lucas, 1959).

3) Determination of average thickness of peat with economic potential from published study by United States Geological Survey involving testing at twenty localities in Michigan. Cross-check on the percentage of organic soils consisting of economically suitable peat provided by this data. (Soper & Osbon, 1922).

4) Review of published material on character, occurrence and reserves of peat, mainly in Michigan. (Davis, 1907) (Davis; 1909) (Graham & Tibbetts, 1961).

5) Review of open-file reports and data on composition and character of peat contained in Geological Survey files.

CALCULATION OF RESERVES

Data Utilized

County Soil Surveys

1)	Counties mapped in sufficient detail to show peat type. (Figure 1, Table 1).		69
	a) Greenwood peat and Spalding peat present.	50	
	b) Greenwood peat and Spalding peat not present	19	
2)	Counties mapped. Acreage and area percent of peat types given. (Figure 2)		57
	a) Greenwood peat and Spalding peat present	38	
	b) Greenwood peat and Spalding peat not present	19	

Acreages

3)	Greenwood peat and Spalding peat in 57 counties mapped.	308,292
4)	Organic soils in 57 counties mapped. (Davis & Lucas, Table 4, pp. 36-37.)	3,068,467
5)	Total area in 57 counties mapped	23,954,096
6)	Total area of Organic soils in State. (Davis & Lucas, table 4, p. 36-37).	4,529,845

Percentages

7)	Greenwood peat & Spalding peat of Organic soils (57 counties).	10.0
8)	Organic Soils of total area (57 counties).	12.8

Thickness of potentially suitable peat (Soper and Osbon, pp. 35 & 96-102).

9)	Average thickness of 4500 acres of peat with ash content of less than 20 percent and thickness greater than 5 feet. (Figure 3, Table 2. Localities Nos. 1, 2, 5, 9, 10, 11, 18 and 19). (Graham & Tibbetts p. 18 & 19).	6.71 feet

10) Average thickness extractable peat (Davis, 1907 pp. 318-319). 6.00 feet

Yield of peat per acre - foot

11) Quantity of air-dried peat, short tons (Davis, 1907 p. 306) 200

Estimated previous production

12) Peat production to date, short tons. (MGS files = 4,053,997) 4,100,000

CALCULATIONS

1) Acreage of organic soils in Michigan (AcO) 4,529,845

2) Percent organic soils consisting of economically suitable peat (ESP) 10

3) Thickness in feet of extractable peat (EXP) 6

4) Short tons peat per acre feet (Y) 200

5) Short tons peat produced to date (P_RP) 4,100,000

Utilizing the above figures, the reserves are calculated as follows:

$$\text{Reserves} = AcO \times ESP \times (EXP \times Y) - P_RP$$

$$= 4{,}529{,}845 \text{ Acres} \times 0.10 \left(6 \text{ ft.} \times \frac{200 \text{ sh. tons}}{\text{Acre ft}}\right) - 4{,}100{,}000 \text{ sh tons}$$

$$= 452{,}984 \text{ Acres} \times \frac{1200 \text{ sh. tons}}{\text{Acre}}) - 4{,}100{,}000 \text{ sh. tons.}$$

$$= 543{,}580{,}800 \text{ sh. tons.} - 4{,}100{,}000 \text{ sh. tons}$$

$$= \underline{539{,}480{,}800 \text{ sh. tons of air dried peat}}$$

In terms of calorific value based on one ton of air dried peat being equal to 0.5 tons of bituminous coal, the above tonnage would be equivalent to 269,740,400 short tons of bituminous coal. (Soper & Osbon, p.18).

Discussion

The use of the Greenwood peat and Spalding peat as estimators for reserves is based primarily on the fact that both types form deposits that are greater than 42 inches in depth and account for over 80 percent of Michigan's commercial peat production. The Greenwood peat is characterized by a fibrous surface layer, up to 12 inches in thickness. This in turn is underlain by undecomposed fibrous peat. The Spalding peat has a surface layer of up to 12 inches of woody and fibrous material. Underlying this is undecomposed fibrous peat.

The classification of organic soils (Davis & Lucas, p.29) is given in Table 3 and illustrates the various types occurring in Michigan. The classification is based on botanitical composition, depth, soil reaction and character of material underlying shallow deposits and is very useful in working with the county soil survey maps and reports.

In terms of calorific and ash contents, very little data is on file for the various peat types. The following brief tabulation does indicate that the Greenwood and Spalding peat types may have slightly higher BTU values with the Greenwood exhibiting possible lower ash contents, additional study will have to be undertaken to determine relative values of the varying types of peat.

SELECTED PEAT ANALYSIS - MENOMINEE COUNTY

Results calculated to a moisture free basis.

Samples from upper 3 feet of Deposit.

Peat Type	Texture	Lab No.	Ash % Wt.	BTU
Greenwood	Granular-Fibrous	A16718	9.9	9,460
	Fibrous	A16736	6.2	9,000
	Fibrous	A16734	2.9	8,330
Spalding	Woody	A16723	9.7	8,820
	Fibrous-Woody	A16722	9.7	8,510
Houghton	Fibrous	A16733	9.1	8,680
Carbondale	Woody	A16721	10.3	8,650
	Woody	A16719	15.8	7,940
	Woody Decayed	A16729	16.5	7,680

Samples collected 1925. Analyzed by U. S. Bureau of Mines.

In terms of distribution, the Northern Peninsula has the greater acreages of Greenwood and Spalding types of peat. Comparative acreages of the counties for which data is available, six in the Northern and 51 in the Southern Peninsula, about 80% is in the former. This agrees with the earlier published estimate. (Soper and Osbon, p.97).

This can be seen when acreages and present areas are reviewed on Figure 2 and Table 1. The six counties in the Northern Peninsula for which data is available show a range in acreage and percent county area from 31,552 - 3.1% for Chippewa up to 62,272 - 10.7% for Luce.

It is commonly thought the size of individual deposits are much larger in the Northern Peninsula as compared to those of the Southern Peninsula. No attempt was made in the present review to develop data as to deposit size. Should additional study be undertaken this should be of primary importance. It is felt that deposits should be 75 to 100 acres in size to be economically feasible (Graham & Tibbets p. 18 & 19).

Michigan is the nations No. 1 producer of peat. Advance data for 1974 from the U. S. Bureau of Mines shows Michigan accounting for 37% of the peat produced in the United States and leading the No. 2 state, Illinois by a factor of almost 3 times. The state has been the number 1 peat producer since 1957 and has only utilized 0.7 percent of the natural resource. There are presently, 1974 calendar year, 17 producers extracting peat at 18 localities. Peat is used mainly for soil improvement.

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November 26, 1975

Revised April 1, 1976

References

1. Davis, J. F. and Lucas, R. E. (1959) "Organic Soils - Their formation, distribution, utilization and management", Department of Soil Sciences, Agricultural Experiment Station, Michigan State University, 156 pp.

2. Soper, E. K. and Osbon, C. C. (1922) "The Occurrence and Uses of Peat in the United States", Bulletin 728, United States Geological Survey, 207 pp.

3. Davis, C. A. (1907) "Peat - Essay on its Origin, Uses and Distribution in Michigan", Geological Survey of Michigan, Annual Report, 1906, 395 pp.

4. _____(1909) "Peat Resources of the United States, Exclusive of Alaska", in Papers on the Conservation of Mineral Resources, Bulletin 394, United States Geological Survey, pp. 62-69.

5. Graham, R. B. and Tibbetts, T. E. (1961) "Evaluation of Peat Moss as Applied to some Bogs in Southern Ontario", Technical Bulletin 22, Canada Department Mines and Technical Surveys, 100 pp.

FURTHER READING

The following references were uncovered after completion of this report and are included here for additional background material.

1. ASTM (1974) "Natural Building Stones; Soil and Rock; Peats, Mosses, and Humus", Part 19, 1974 Annual Book of ASTM Standards, American Society for Testing and Materials, Philadelphia, Pa.,

The following designations apply to organic soils.

D 2607-69: Classification of Peats, Mosses, Humus and Related products. p.321
D 2944-71: Sampling Peat Materials. p. 375.
D 2973-71: Total Nitrogen in Peat Materials. pp. 378-379.
D 2974-71: Moisture, Ash, and Organic Matter of Peat Materials. pp. 380-381.
D 2975-71: Sand Contents of Peat Materials. p. 382.
D 2976-71: pH of Peat Materials. pp. 383-384.
D 2977-71: Particle Size Range of Peat Materials. pp. 385-386.
D 2978-71: Volume of Peat Materials. p. 387.
D 2980-71: Volume Weights, Water-Holding Capacity, and Air Capacity of Water-Saturated Peat Materials. pp. 388-389.

2. Averitt, Paul (1975) "Coal Resources of the United States, January 1, 1974," Bulletin 1412, United States Geological Survey, 131 pp. Pages 58-59 on Peat.

3. Cameron, C. C. (1968) "Peat" in Mineral Resources of the Appalachian Region: Prof. Paper 580, United States Geological Survey, pp. 136-145.

4. _____(1970) "Peat Deposits of Northeastern Pennsylvania"; Bulletin 1317-A, United States Geological Survey, 90 pp.

5. _____(1970) "Peat Deposits of Southeastern New York", Bulletin 1317-B, United States Geological Survey, 32 pp.

6. _____(1970) "Peat Resources of the Unglaciated Uplands Along the Alleghany Structural Front in West Virginia, Maryland, and Pennsylvania", in Geological Survey Research 1970: Prof. Paper 700-D, United States Geological Survey, pp. D153-D161.

7. _____(1975) "Some Peat Deposits in Washington and Southeastern Aroostock Counties, Maine": Bulletin 1317-C, United States Geological Survey, 40 pp.

8. Carter, James E. (1976) "Peat in Minnesota - An Assessment", Minnesota Energy Agency, 17 pp.

9. _____(1976) "Peat - Technology Transfer Visit to Europe, Fall, 1975", Minnesota Energy Agency, 22 pp.

10. Moore, P.D. and Bellamy, D.J. (1973) "Peatlands", Springer-Verlag New York, Inc., New York, N.Y., 224 pp.

11. National Research Council of Canada (1970). "International Peat Congress, 3rd. 1968 Proceedings, Quebec, Canada", Ottawa, Canada.

County	Acres	Total Organic Soils*		Peat Organic Soils				Soil Survey				
								Formal			Reconnisance	
		Acres	%	Type	Acres	%	% Organic	Series	Number	Date Issued	Map	Legend
Alcona		58,577		G							1941	1950
Alger	583,680	111,936	19.1	G,S	20,224	3.4		1929	32	1934		
Allegan		49,280	9.3							1905		
Alpena	337,880	76,672	21.4	G	1,408	0.4		1924	28	1929		
Antrim	311,040	23,744	7.6	G	832	0.3				1928		
Arenac	235,520	20,480		G-D	215	0.1				1967		
Baraga		48,640		G,S							1941	1950
Barry	357,760	43,072	12.0	G	4,416	1.2		1924	14	1928		
Bay	283,520	10,560	3.8	G	64	0.1		1931	6			
Benzie		24,000		N.Id.							1935	1935
Berrien	371,008	21,504	5.9	G	0					1927		
Branch	321,920	39,424	12.3	G	128	0.1		1928	23	1932		
Calhoun	443,520	55,616	12.5	G	0					1919		
Cass		25,728	8.0							1907		
Charlevoix	264,960	30,104		G	593	0.2				1974		
Cheboygan	464,000	71,360	15.3	G,S	5248	1.1		1934	15	1939		
Chippewa	1,006,720	188,608	18.7	G,S	31,552	3.1		1927	36	1932		
Clare		40,320										
Clinton	365,440	31,488		G,S	0			1936	12	1942		
Crawford	359,040	32,640	9.0	G	2,816	0.8		1927	29	1931		
Delta		127,046		G,S								

Table 1. Distribution of Peat.

* From Spec. Bull. 425 "Organic Soils", By J.F. Davis & R.E. Lucas, Dept. Soil Sciences, Michigan State University, 1959

County	Acres	Total Organic Soils		Peat Organic Soils				Soil Survey				
								Formal			Reconnisance	
		Acres	%	Type	Acres	%	% Organic	Series	Number	Date Issued	Map	Legend
Dickinson		145,920		G,S							1938	1951
Eaton	369,920	38,720	10.5	G	192	0.1		1930	10	1933		
Emmet	295,040	69,760		G	646	0.2				1973		
Genesee	412,160	24,192	5.7	G,S	0					1972		
Gladwin	322,176	35,000		G,S	0					1972		
Gogebic		135,317		G,S							1949	1950
Gr. Traverse	296,960	32,000		G	1409	0.5		1958	34	1966		
Gratiot		12,000								1905		
Hillsdale	384,640	40,640	10.6	G	192	0.1		1924	10	1928		
Houghton		56,040		G,S							1942-1943	1949
Huron		11,000										
Ingham	353,920	48,841	13.3	G	640	0.2		1933	36	1941		
Ionia	368,000	30,000		G,S	0					1967		
Iosco		33,218		G								
Iron	751,360	140,480	18.6	G,S	58,560	7.8		1930	46	1937		
Isabella	366,080	30,720	8.4	N.Id.				1923	36	1928		
Jackson	452,480	91,904	20.4	G	1,536	0.3		1926	17	1930		
Kalamazoo	359,680	53,312	14.8	N.Id.						1926		
Kalkaska	357,760	38,016	10.7	G	2,368	0.7		1927	28	1931		
Kent	540,800	37,440	7.0	G	1,088	0.2		1926	10	1930		
Keweenaw		15,000										

Table 1. Distribution Of Peat.

Michigan Geological Survey

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County	Acres	Total Organic Soils		Peat Organic Soils				Soil Survey				
								Formal			Reconnisance	
		Acres	%	Type	Acres	%	% Organic	Series	Number	Date Issued	Map	Legend
Lake		41,600										
Lapeer	421,760	44,800		G-S	1,157	0.3				1972		
Leelanau	223,360	26,800		G,S	0					1973		
Lenawee	482,560	12,800		G,S	0			1947	10	1961		
Livingston	365,440 / 363,520	80,512	22.2	G,S / G	0 / 1,216	0 / 0.3		1923	37	1974 / 1928		
Luce	581,120	195,392	33.4	G,S	62,272	10.7		1929	36	1935		
Mackinac		147,150		G,S							1952	1952
Macomb	307,840	1,472	0.5	G,S	0					1971		
Manistee	346,880	22,656	6.6	N.Id.						1926		
Marquette		265,024		G,S								
Mason	316,160	28,608	9.1	G	1,664	0.5		1936	1	1939		
Mecosta	360,320	29,760	8.3	G	2,432	0.7		1927	18	1931		
Menominee	675,840	230,208	34.1	G-S	25,792	3.8		1925	31	1929		
Midland	332,800	3,200		N.Id.				1938	26	1950		
Missaukee		60,304		G-H							1942	1951
Monroe		3,650										
Montcalm	455,680	64,957		G-D	4,913	1.1		1949	11	1960		
Montmorency	353,920	49,408	13.9	G	1,024	0.3		1930	39	1936		
Muskegon	322,560 / 328,960	24,832	7.5	G	0 / 1,024	0.3		1924	22	1968 / 1929		
Newaygo	548,480	41,083		G	3,124	0.6		1939	9	1951		
Oakland	575,360	64,000		G	0						1934	1934

Table 1. Distribution of Peat.

County	Acres	Total Organic Soils		Peat Organic Soils				Soil Survey Formal			Soil Survey Reconnisance	
		Acres	%	Type	Acres	%	% Organic	Series	Number	Date Issued	Map	Legend
Oceana	347,520	33,216	9.7	G	1600	0.5		1933	12	1938		
Ogemaw	365,440	50,496	13.9	G	2048	0.6		1923	28	1928		
Ontonogon	840,960	18,176	2.1	N.Id. / G-S						1923	1950	1950
Osceola	371,840	26,240		G	1395	0.4				1969		
Oscoda	364,800	23,744	6.5	G	1408	0.4		1931	20	1936		
Otsego		31,000		G							1939	1949
Ottawa	360,960	13,056	3.6	G	0					1972		
Presque Isle	433,920	90,320		G	6887	1.6					1954	1954
Roscommon	328,320	80,640	24.6	G	6784	2.1		1924	27	1929		
Saginaw	518,400	9,536	1.7	G	0			1933	19	1938		
Sanilac	615,000	43,330		G,S	4631	0.7		1953	10	1961		
Schoolcraft	772,480	170,176	22.0	G,S	44,352	5.8		1932	37	1939		
Shiawassee	345,600	22,000		G	0					1974		
St. Clair	473,600 / 464,640	27,712	6.0	G / G	0 / 384	0.1		1929	27	1974 / 1934		
St. Joseph	321,920	44,864	13.9	G	0					1923		
Tuscola	519,680	46,208	8.9	G	512	0.1		1926	29	1931		
Van Buren	389,760	43,456	11.1	G	0					1926		
Washtenaw	456,960	56,896	12.5	G	2176	0.5		1930	21	1934		
Wayne		2,500										
Wexford	366,272	7,744	2.1	G	0					1909		

TABLE 1. DISTRIBUTION OF PEAT.

G = GREENWOOD; G,S = GREENWOOD & SPALDING
G-S = GREENWOOD & SPALDING UNDIFFERENTIATED.
G-H = GREENWOOD & HOUGHTON } UNDIFFERENTIATED
G-D = GREENWOOD & DAWSON }

N.Id. = MAPPED AS PEAT & MUCK UNDIFFERENTIATED

MICHIGAN GEOLOGICAL SURVEY
WA WALDON Nov 21, 1975

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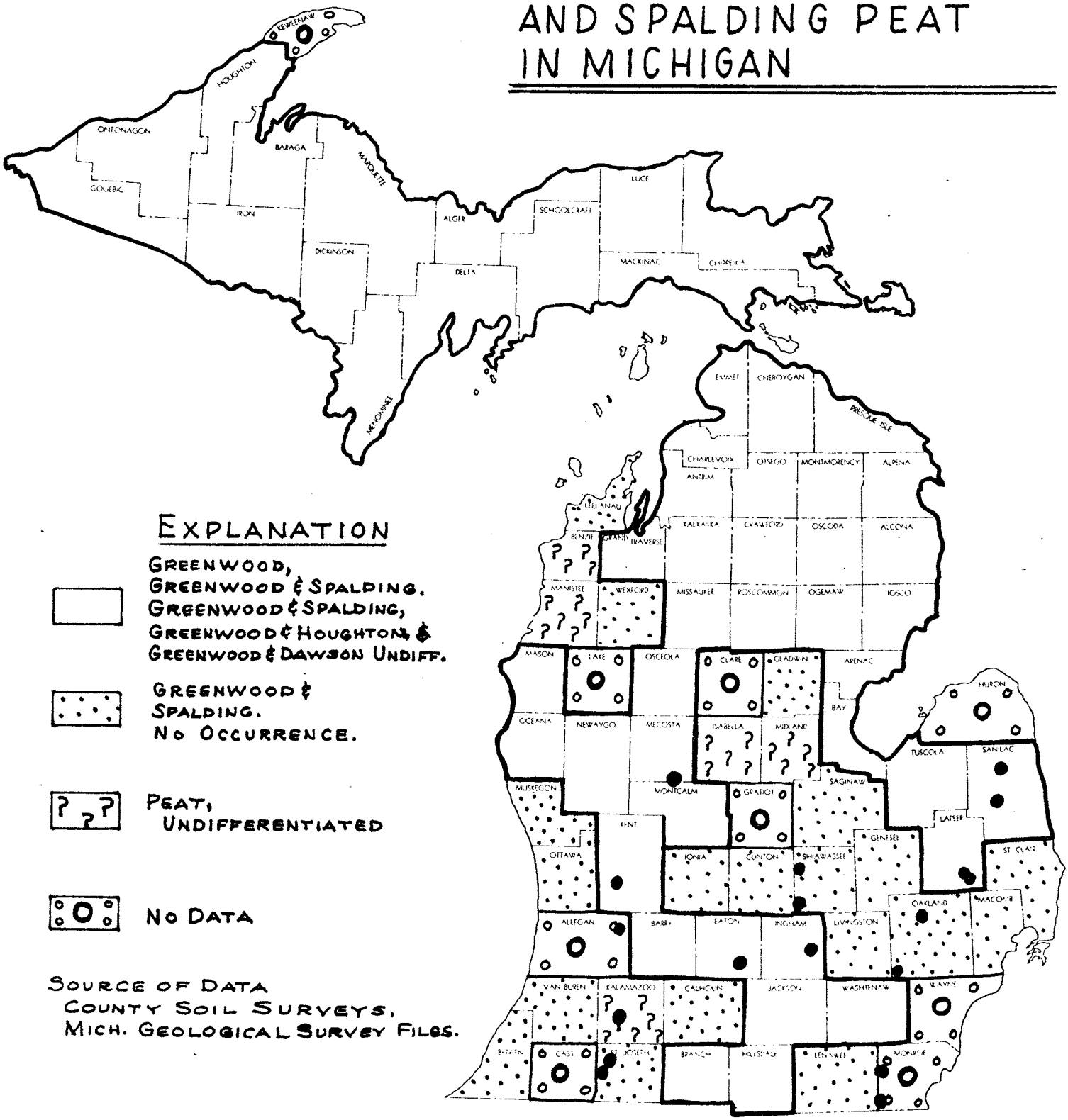
OCCURRENCE BY COUNTY OF GREENWOOD AND SPALDING PEAT IN MICHIGAN



EXPLANATION

GREENWOOD,
GREENWOOD & SPALDING.
GREENWOOD & SPALDING,
GREENWOOD & HOUGHTON, &
GREENWOOD & DAWSON UNDIFF.

GREENWOOD & SPALDING.
NO OCCURRENCE.

PEAT, UNDIFFERENTIATED

NO DATA

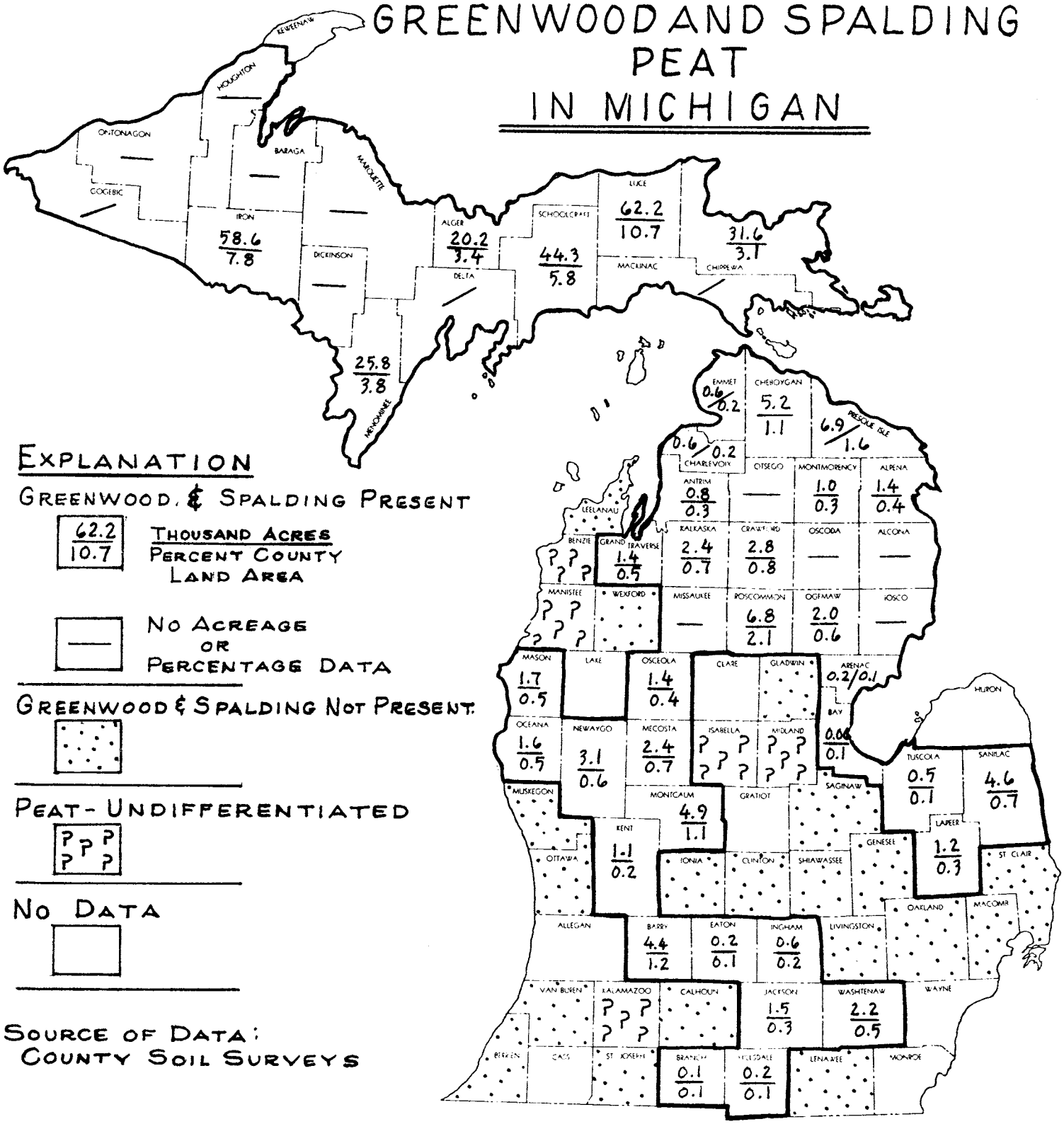
SOURCE OF DATA
COUNTY SOIL SURVEYS,
MICH. GEOLOGICAL SURVEY FILES.

MICHIGAN GEOLOGICAL SURVEY
W. A. WALDEN NOV. 20, 1975

● PEAT PRODUCER 1974

FIGURE 1.

ACREAGE AND PERCENT COUNTY LAND AREA~ GREENWOOD AND SPALDING PEAT IN MICHIGAN



EXPLANATION

GREENWOOD & SPALDING PRESENT

62.2 / 10.7 — THOUSAND ACRES / PERCENT COUNTY LAND AREA

— NO ACREAGE OR PERCENTAGE DATA

GREENWOOD & SPALDING NOT PRESENT

PEAT- UNDIFFERENTIATED

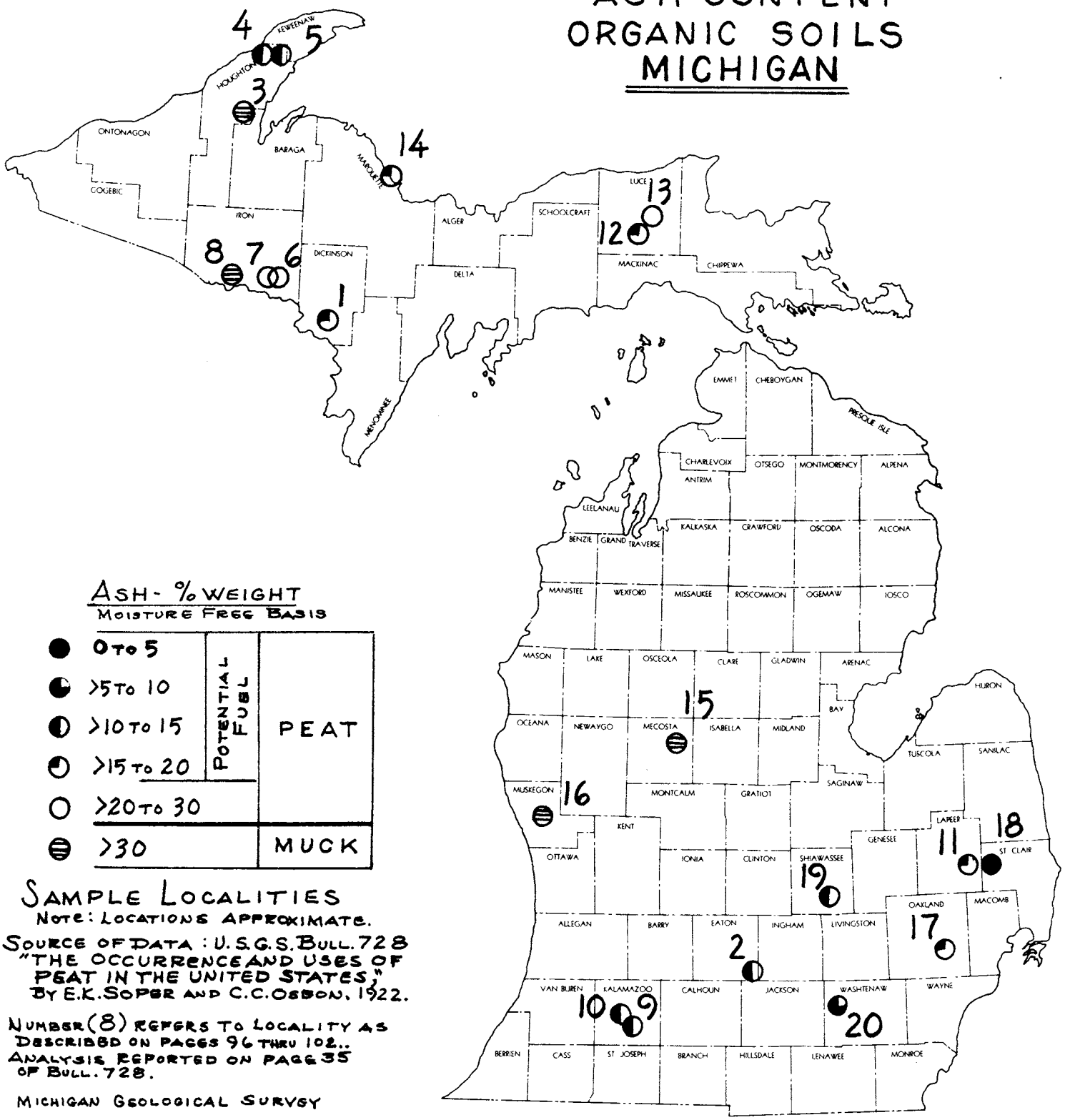
NO DATA

SOURCE OF DATA: COUNTY SOIL SURVEYS

MICHIGAN GEOLOGICAL SURVEY
W.A. WALDEN Nov. 24, 1975

FIGURE 2.

SAMPLE LOCALITIES AND ASH CONTENT ORGANIC SOILS MICHIGAN



ASH - % WEIGHT
MOISTURE FREE BASIS

● 0 TO 5	POTENTIAL FUEL	PEAT
◕ >5 TO 10		
◐ >10 TO 15		
◔ >15 TO 20		
○ >20 TO 30		
≡ >30		MUCK

SAMPLE LOCALITIES

NOTE: LOCATIONS APPROXIMATE.

SOURCE OF DATA: U.S.G.S. BULL. 728 "THE OCCURRENCE AND USES OF PEAT IN THE UNITED STATES," BY E.K. SOPER AND C.C. OSSON, 1922.

NUMBER (8) REFERS TO LOCALITY AS DESCRIBED ON PAGES 96 THRU 102.. ANALYSIS REPORTED ON PAGE 35 OF BULL. 728.

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W.A. WALDEN OCT. 28, 1975

FIGURE 3.

TABLE 2. COMPILATION SUMMARY PEAT OCCURRENCE, CHARACTER AND COMPOSITION IN MICHIGAN

Locality No.	County	Township T & R	Section	Area (Acres)	Thickness (Feet)	Tonnage	Type of Peat	Type of Sample	Analysis No.	Proximate: Volatile Matter	Proximate: Fixed Carbon	Ultimate: Ash	Ultimate: Sulfur	Ultimate: Nitrogen	Calorific Value British Thermal Units
1	Dickinson	Norway (40N, 29W?)	NE 7, NW 8	130	5'	130,000	Dk brn, well decomp. Sedges grasses	Composite	383	54.39	28.20	17.41	1.33	1.89	7,727
2	Eaton	T1N, R3W	(12 or 13 ?)	400	7	560,000	Brn, fibrous & woody, grasses sedges	Composite	351	36.66	49.18	14.16	0.49	2.83	7,827
									352	43.82	43.56	12.62	0.50	3.00	8,066
3	Houghton	(T51, 52, 53N?) (R33, 34, 35W?) Sturgeon River Valley near Klingville		23,040	5	23,000,000	Brn, fibrous & woody, Lower is brn, well decomp, soft & plastic. Sphagnum moss	Composite peat & muck @ 2' interval	372	39.68	19.64	40.68	0.36	1.44	N.D.
								Muck	373	39.28	18.69	42.03	0.32	1.99	N.D.
								Peat	375	45.18	25.24	29.58	0.33	1.94	N.D.
4		Calumet T56N, R33W	NE 22 NW 23	NA	Shallow	N.D. Not of Econ. sign.	Brn, fibrous & woody Tamerack-poplar some sphagnum.	Composite	378	55.83	31.85	12.32	0.27	1.96	8,505
5		Near Hecla Mine Shaft		15	12	N.D. Drained too dry	Brn, coarse fibrous, grasses	Channel (?)	379	55.34	30.54	14.12	0.61	2.53	N.D.
6	Iron	T43N, R32W	C 22	6	4	N.D.	Brn, fibrous & woody-sedges & sphagnum.	Not given	380	49.47	22.98	27.55	0.38	2.64	7,349
7		Crystal Falls (T43N, R33W?)	SW 16 NW 21	90	3	N.D.	Dk, brn, well decomp. Sedges & reeds.	Composite	381	51.91	27.13	20.96	0.56	1.99	8,294

TABLE 2. COMPILATION SUMMARY PEAT OCCURRENCE, CHARACTER AND COMPOSITION IN MICHIGAN

Locality No.	County	Township T & R	Section	Area (Acres)	Thickness (Feet)	Tonnage	Type of Peat	Type of Sample	Analysis No.	Proximate: Volatile Matter	Proximate: Fixed Carbon	Ultimate: Ash	Ultimate: Sulfur	Ultimate: Nitrogen	Calorific Value British Thermal Units
8	Iron	Bates T43N, R34W	SE 19 SW 20 W½ 29 NE 30	120	3	N.D.	Dk brn, fibrous sphagnum, reeds & sedges	Composite	382	41.08	17.37	41.55	0.61	2.20	N.D.
	Kalamazoo	(T3S, R10W?)		400	5	400,000	Blk muck @ surf. Brn to blk Fibrous sedges & grasses	Composite	347	35.92	51.37	12.71	0.46	3,58	8,203
10		South part of city Kalamazoo (T2S, R11W?)		30	6		Brn, Fibrous	Dry, Pressed Peat.	348	34.51	49.50	15.99	0.60	3.14	7,821
									349	35.91	51.24	12.85	0.61	2.82	8,242
								Composite	350	37.16	52.17	10.67	0.72	3.16	8,592
11	Lapeer	East of Imlay City (T7N, R12E?)	(E½ Twp?)	200	8		Dk brn, well decomp, plastic some woody mat grasses-sedges	Composite	357	46.48	37.59	15.93	1.75	2.24	9,186
12	Luce	(T46N, R10W?)		150	4		Dk brn, well decomp, woody sedges, moss, conifers	Composite	369	52.62	28.16	19.22	0.90	1.86	7,865
13		North Newberry (T47N, R9-10W ?)		Several hundred	4Δ		Dk brn to blk well decomp. sedge & grass	Not given	370	55.21	23.68	21.11	0.60	1.76	7,098

TABLE 2. COMPILATION SUMMARY PEAT OCCURRENCE, CHARACTER AND COMPOSITION IN MICHIGAN

Locality No.	County	Township T & R	Section	Area (Acres)	Thickness (Feet)	Tonnage	Type of Peat	Type of Sample	Analysis No.	Proximate: Volatile Matter	Proximate: Fixed Carbon	Ultimate: Ash	Ultimate: Sulfur	Ultimate: Nitrogen	Calorific Value British Thermal Units
14	Marquette	Northern part city Marquette (T48N, R25W?)		300	2	Too thin for extract	Blk, fibrous to plastic, grass & mosses	Not given	371	52.84	31.46	15.70	0.35	1.97	7,982
15	Mecosta	N.E. Village of Mecosta (T15N, R7-8E?)		3,500	4-16 (7')	4,900,000	Dk brn fibrous & woody & muck	Composite	365	64.97	3.90	31.30	2.39	1.42	N.D.
									366	42.26	10.94	46.80	3.48	1.97	N.D.
									367	54.71	18.34	26.95	0.41	1.97	6,163
									368	57.61	16.77	25.62	2.18	1.69	6,728
16	Muskegon	Muskegon Twp. T10N, R16W	NE Twp.	3,000	5		Brn, fibrous sandy muck.	Composite	364	23.84	17.84	58.32	0.24	1.69	N.D.
17	Oakland	Pontiac T3N, R10E	C 32	40	2½	Not of Econ. Sign.	Dk brn, well decomp, plastic sedges	Composite	356	50.46	31.00	18.54	0.75	3.22	7,472
18	St. Clair	West of Capac (T7N, R13E?)		3,000	7	Too fibrous for fuel	Brn, fibrous Grasses, sedges, reeds blueberry	Composite Channels	358	55.77	42.23	2.00	0.27	0.90	9,033
									359	55.73	42.66	1.61	0.25	0.93	8,917
									360	54.77	41.96	3.27	0.22	1.43	9,071
19	Shiawassee	2 Mi. West of Bancroft (T6N, R3E?)		300	5		Dk brn to blk, well decomp., plastic, sedge, reed, grass, bullrush.	Composite	361	52.50	37.53	9.97	0.39	3.51	8,580
									362	52.34	37.30	10.36	0.43	3.39	8,548
									363	56.35	30.01	13.64	0.57	3.25	8,328

Locality No.	County	Township T & R	Section	Area (Acres)	Thickness (Feet)	Tonnage	Type of Peat	Type of Sample	Analysis No.	Proximate		Ultimate			Calorific Value British Thermal Units
										Volatile Matter	Fixed Carbon	Ash	Sulfur	Nitrogen	
20	Washtenaw	Southern part of Chelsea (T2S,R3-4E?)	Sec. 13 & Sec. 18?	100	3		Brn, fibrous flaky. Grasses, mosses, blueberry	Composite	353	35.24	59.83	4.93	0.20	2.30	9,479
									354	41.37	54.10	4.53	0.20	1.96	9,721
									355	28.57	61.46	9.97	0.23	2.55	9,362

Δ Not used in average thickness calculation.

Source of Data: E. K. Soper & C. C. Osbon (1922) "The Occurrence and Uses of Peat in the United States" Bulletin 728, U. S. Geological Survey - pp. 35 & 96 to 102.

TABLE 3--Michigan classification of organic soils, June, 1959 (c)

Soil order--Intrazonal

Great soil group--Organic soils (bog)

Character of organic material				Depth of organic material				
(a) 0" to 12"		12" to 42"	pH between 12"-24"	Deep over 42"	(b) Shallow (12"-42")			
					Over sands	Over loams	Over clays	Over marl
Woody	Deciduous and conifers	Black, granular, well-decomposed woody over undecomposed brown fibrous	8.3 to 7.0	Lupton	Markey	045		Edwards
	Deciduous	Dark brown, slightly to moderately decomposed over undecomposed brown fibrous	7.0 to 5.0	Carlisle	Tawas	Linwood	Willette	
	Conifers	Dark brown, slightly to moderately decomposed over undecomposed brown fibrous	7.0 to 5.0	Carbondale				
	Conifers and deciduous	Brown to yellow undecomposed fibrous	6.5 to 4.5	Rifle				
Woody and fibrous	Conifers and marsh	Brown to yellow undecomposed fibrous	5.0 to 3.0	Spalding	Dawson			
Fibrous	Leather leaf bogs	Yellow, undecomposed fibrous	5.0 to 3.0	Greenwood	Dawson			
	Marsh	Dark brown yellow finely fibrous	Calcar.			-033		
	Marsh	Dark brown yellow finely fibrous	7.0 to 5.0	Houghton	Adrian	Palms	Ogden	Rollin
	Marshland	Undecomposed over semi-fluid mass or water	7.0 to 5.0	Tahquamenon				

(a) The stage of decomposition of the surface 12 inches is reflected by the type name. Except for the well-decomposed and moderately well-decomposed organic materials, each series may include a muck type and a peat type as Houghton muck and Houghton peat.
(b) Usually has a lower colloidal layer (anaerobic decomposition or sedimentary peat).
(c) Classification from E. P. Whiteside, I. F. Schneider and C. A. Engberg.
SOURCE OF DATA: J. F. Davis & R. E. Lucas (1959)
"Organic Soils-Their formation, distribution, utilization and management", Special Bulletin 425, Dept. Soil Sciences, Agricultural Experiment Station, Michigan State Univ