ILLINOIS STATE GEOLOGICAL SURVEY

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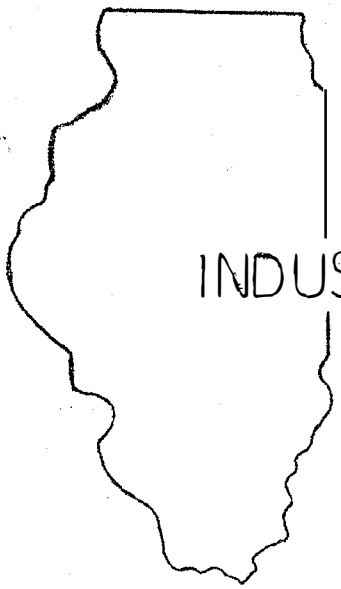

INDUSTRIAL MINERALS NOTES 37

PEAT AND HUMUS IN ILLINOIS

Norman C. Hester and J. E. Lamar

ABSTRACT

The peat deposits of Illinois have been worked for over 100 years. The present peat-producing industry is located near Morrison in northwestern Illinois and in Lake, Kane, and McHenry Counties in the northeastern part of the state. Undeveloped deposits also exist.

Peat is now used principally for horticultural purposes, as is the humus that is produced in northeastern Illinois. Five companies produce peat at the present time, one produces peat and humus, and one produces humus.

Examination of Illinois peats shows them to be chiefly of the reed-and-sedge variety, but moss peat occurs in some areas. Chemical and physical test data indicate the characteristics of the peat.

PEAT AND HUMUS IN ILLINOIS

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INTRODUCTION

When the last glacier to invade Illinois had melted, many lakes formed in depressions in the land surface, especially in the northeastern part of the state. Other relatively shallow lakes were left on the floors of valleys that had carried the torrents of flood water from the melting ice.

In time, a vigorous growth of various kinds of plants was established in the shallows of some lakes. When this vegetation died, its remains accumulated beneath the water, where the more fibrous parts of the plants were preserved as a black or brown substance called peat. As years passed, the vegetation pushed progressively farther into the lakes, filling some of them and partly filling others, thus forming peat bogs.

Peat from Illinois deposits has been used in various ways for over 100 years (Lamar and Bradbury, 1968). Around 1860, and probably earlier, peat was dug for fuel in McHenry, Whiteside, Kane, Cook, Lake, and Kendall Counties. In McHenry County it was used to fire the kilns and steam engine of a clay products plant at Woodstock. Near Morrison in Whiteside County, blocks of sun-dried peat fuel were used for domestic heating and lime burning. Three hundred tons of such fuel was produced in 1867. Another peat deposit in Tazewell and Mason Counties, near Manito, was opened in 1905 and was worked until the early 1950's, reportedly as a source of peat for packing material and horticultural purposes.

Peat is now used primarily as a horticultural material. In 1967, almost $700,000 worth of peat was produced from Illinois deposits (Sheridan, 1968) (figs. 1, 2).

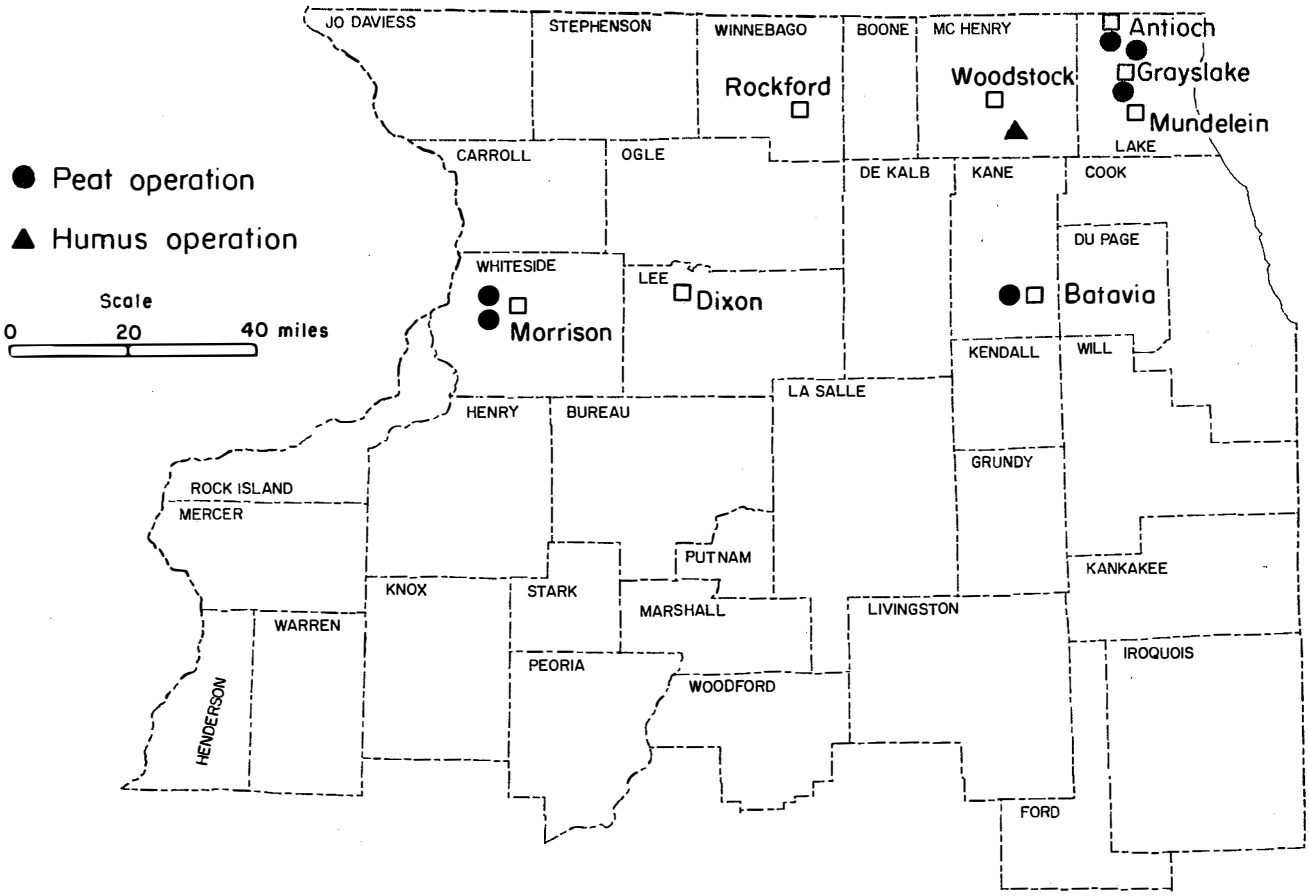


Fig. 1 - Peat and humus operations in Illinois.

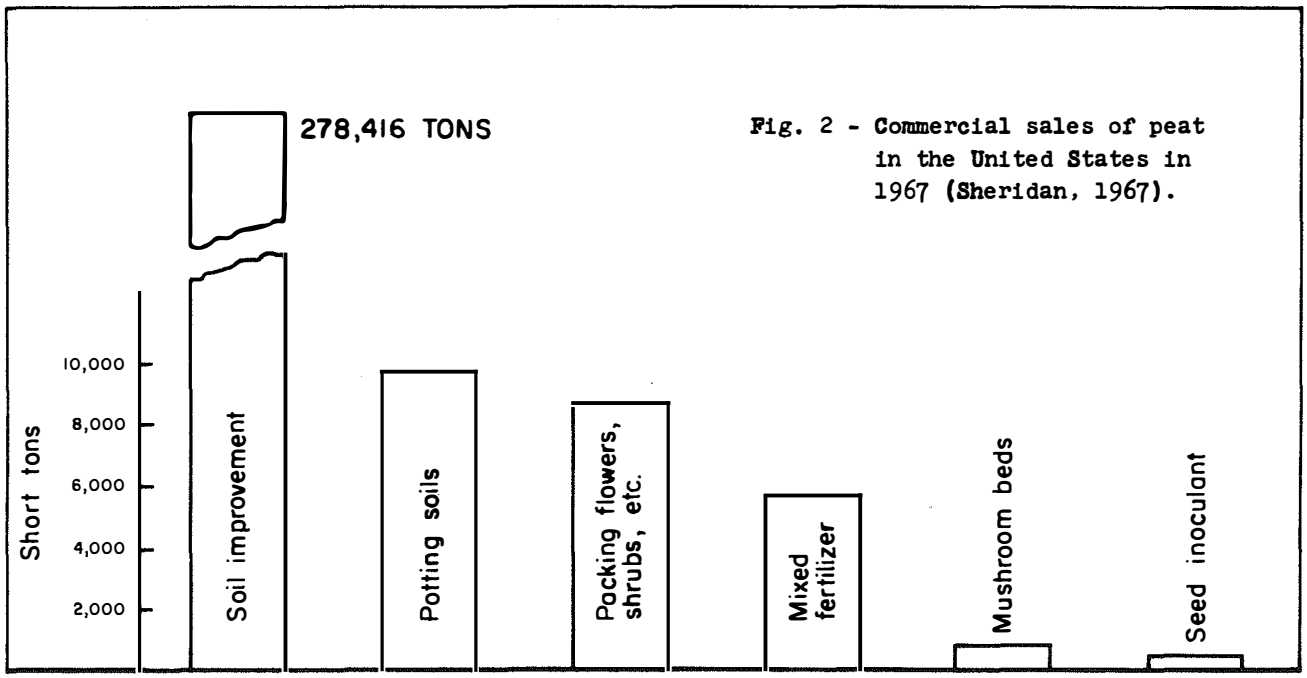


Fig. 2 - Commercial sales of peat in the United States in 1967 (Sheridan, 1967).

This report has been prepared to provide a preliminary picture of the extent and characteristics of the peat resources of Illinois and of the distribution and nature of the peat-producing industry. It deals with only those peat deposits in bogs that are exposed at the ground surface.

Definitions

The terms "peat," "humus" or "peat humus," and "muck" are used to designate the products formed by the natural accumulation of plant materials in poorly drained areas such as bogs and lakes. Peat is defined (Sheridan and DeCarlo, 1957) as "partly decomposed and more or less disintegrated vegetable matter that has accumulated in places where ordinary decay or chemical decomposition of the materials has been retarded by immersion in water." Peat is usually brown or black.

According to Sheridan and DeCarlo (1957), humus is a black or brown material that is formed when peat deposits undergo cultivation or are subjected to long periods of dryness, and peat humus is peat that is so decomposed its biological identity is lost.

Howell (1957) defined muck as a dark colored soil, commonly found in areas of poor drainage, that has a high percentage of decomposed or finely comminuted organic matter. Peat will burn freely when dry, but muck will not (Soper and Osbon, 1922).

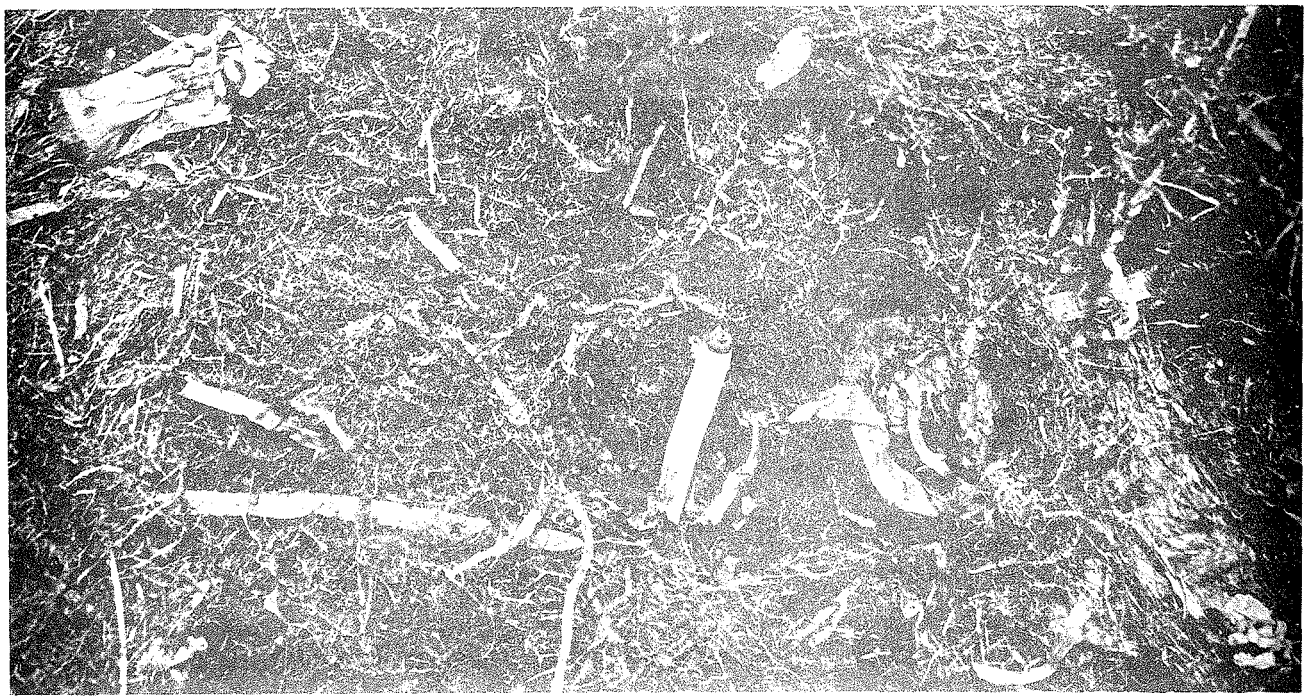
For statistical purposes the U. S. Bureau of Mines (Sheridan and DeCarlo, 1967) classified peat into three types: moss peat, reed-sedge peat, and peat humus. The moss peat consists of sphagnum, hypnum, and other mosses. Reed-sedge peat is composed of fragments of reeds, sedges, shrubs, and trees.

Current specifications pertaining to peat purchased by the Federal Government give the requirements for four types of peat: sphagnum moss peat, other moss peats, humus peat (peat muck), and reed-sedge peat (U. S. General Services Administration, 1961).

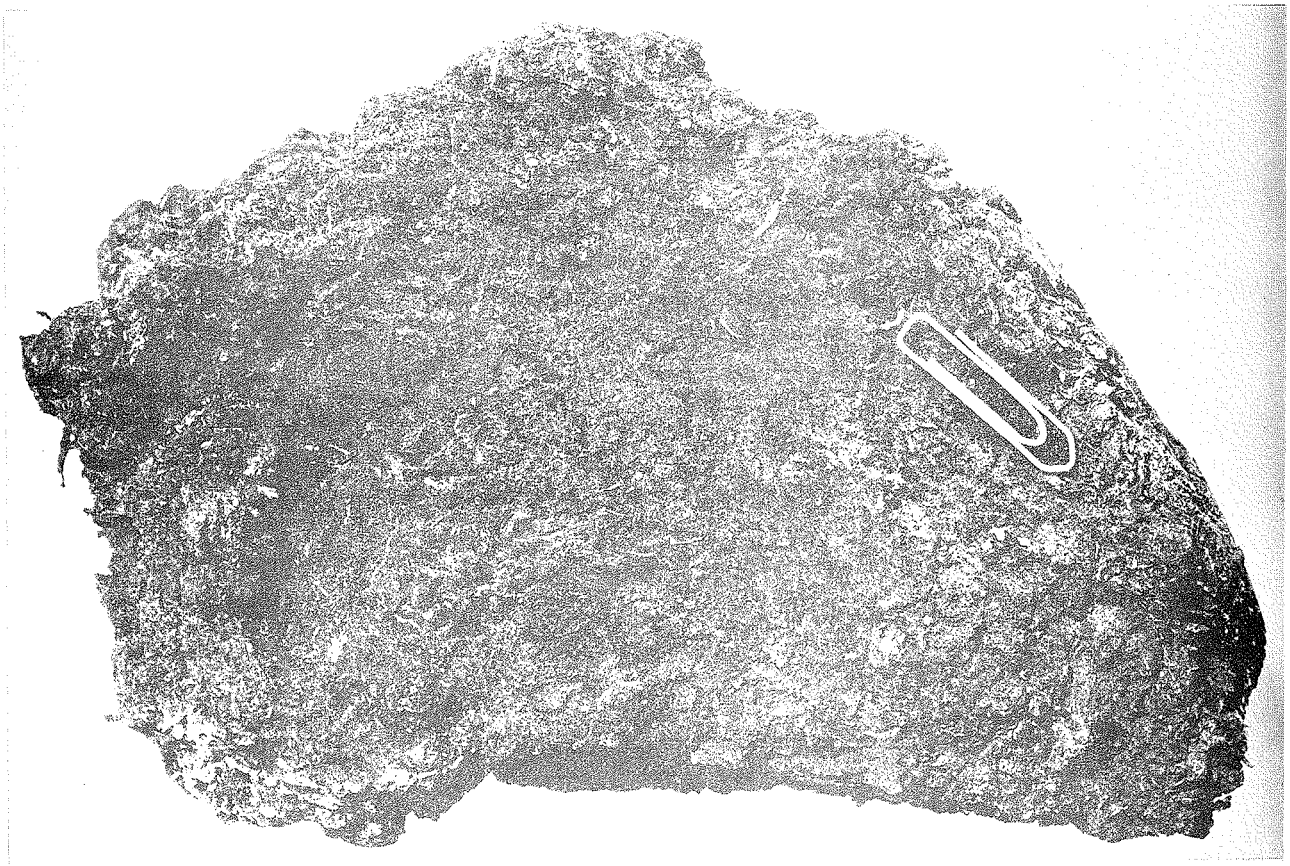
PROPERTIES OF PEAT, HUMUS, AND MUCK

Peat, humus, and muck consist principally of organic matter, mineral matter, and water. The organic matter comes from the plant materials that form the peat (pl. 1). The mineral matter may have three sources: (1) clay, silt, and sand washed or blown into the bog while the peat was forming; (2) minerals dissolved in the water of the bog; and (3) minerals in the plants. In rare instances, peat contains the shells of small mollusks that lived in the lake or bog in which the peat accumulated. One sample of impure Illinois peat contained abundant diatoms, and the chitinous wing covers of beetles were present in others. All these materials contribute to the ash that results when peat is burned.

Owing to the spongy nature of the organic material, air-dried peat, humus, and muck (especially the first two) have a high water-absorbing and



Fibrous brown peat with coarse plant debris. Magnification 2 X.



Very dark brown and black peat. It is more compact and composed of finer material than the peat shown. Structure removed.

PLATE I - PEAT

water-holding capacity. This property and the large amount of organic matter in the materials make them valuable for horticultural purposes.

OCCURRENCE OF PEAT IN ILLINOIS

Peat deposits occur or have been reported at many places in the northern half of Illinois and in some parts of the southern half. Most of the deposits are in depressions once filled by glacial lakes. Other accumulations of peat are found in river floodplains or abandoned channels, some of which were related to glacial activity.

The most comprehensive body of data regarding the geographic occurrence of peat in Illinois appears in the county soil reports published by the Agricultural Experiment Station, University of Illinois, Urbana. According to these reports, Lake, McHenry, Winnebago, Kane, DuPage, Cook, and Whiteside Counties contain, or contained, abundant peat and muck deposits of various sizes. Lee, DeKalb, Henry, Bureau, Rock Island, Will, and Tazewell Counties have fewer peat and muck deposits. As some of the soil reports are comparatively old, it is probable that at least some of the deposits they record are now being used as farm land or for other purposes and are unavailable for commercial production of peat. This applies especially to northeastern Illinois.

Recent publications on sand and gravel occurrences in Boone and McHenry Counties indicated that three large peat deposits are present near Capron in Boone County (Hunter and Kempton, 1967) and numerous deposits exist in the eastern two-thirds of McHenry County (Anderson and Block, 1962). Their availability and suitability for commercial exploitation was not indicated in the reports. Topographic maps of northeastern Illinois show the location of swampy areas, some of which may contain peat.

One of the most detailed investigations known to have been made of Illinois peat deposits is that by Soper and Osbon (1922). The largest deposit they described is in Cattail Valley about 5½ miles west of Morrison in T. 21 N., R. 4 E., Whiteside County. They estimated that a 1280-acre tract near the south end of Cattail Valley might yield approximately 3,840,000 short tons of air-dried material. The deposit was described as being about 15 feet thick. Another deposit in the upper part of the same valley had about 1300 acres of peat averaging 12 feet deep that they estimated to contain approximately 3,120,000 short tons of air-dried peat. Soper and Osbon also described peat deposits in Kane, Kankakee, Lake, Lee, Mason, and Tazewell Counties, the largest of which, in terms of estimated tonnage (440,000 tons), was a marsh located about 3½ miles west of Antioch in Lake County.

Of the 11 peat deposits that Soper and Osbon described, numbers 3, 4, 8, and 9 (table 1) are still present and undeveloped. Number 1 is the site of a high school, park, and lake; 2 is a corn field; 5 the site of a sanitary landfill; part of 6 is a park and part a boat harbor; and 7 is part of Chain O'Lakes State Park. The south part of deposit 15-16 is the site of the two peat-producing operations in the Cattail Valley deposit.

TABLE 1 - PLANT MATERIALS IN PEAT DEPOSITS*

Deposit no.	Location	Plant materials in peat
1	Kane County, parts of secs. 26 and 27, T. 38 N., R. 8 E.	Sedges, grasses, and willows
2	Kankakee County, SW¼ sec. 35, T. 32 N., R. 11 W.	Sedges and grasses†
3	Lake County, parts of secs. 14 and 15, T. 45 N., R. 9 E.	Sedges and grasses
4	Lake County, NW¼ sec. 11, T. 45 N., R. 9 E.	Sedges and grasses (humus)
5	Lake County, parts of secs. 8, 9, 16, and 17, T. 46 N., R. 10 E.	Sedges, grasses, ferns, and reeds
6	Lake County, parts of secs. 12 and 13, T. 46 N., R. 9 E.	Sedges, grass roots, and reeds
7	Lake County, parts of secs. 14 and 15, T. 46 N., R. 9 E.	No data (humus)
8	Lake County, parts of secs. 7 and 18, T. 46 N., R. 10 E.	Sedges, swamp ferns, and moss
9	Lake County, sec. 35, T. 45 N., R. 10 E.	Sedges, grasses, swamp ferns, and moss†
13-14	Tazewell and Mason Counties, parts of secs. 15, 16, 21, and 22, T. 23 N., R. 6 W.	Grasses and milkweed
15-16	Whiteside County, parts of secs. 6, 7, 8, 17, 18, 19, 20, 28, 29, 32, and 33, T. 21 N., R. 4 E.	Grasses, sedges, bulrushes, reeds, and cattails†

* Compiled from Soper and Osbon, 1922, p. 105-111.
† Living vegetation.

Peat was once dug at deposit 13-14, but the operation was discontinued about 1954, according to local reports. The processing plant was located at the center of the SW¼ sec. 15, T. 23 N., R. 6 W., about a mile northeast of Manito. Early peat digging operations were situated a short distance northeast of Manito, but the most recent production was in the NE¼ SE¼ sec. 26 and NW¼ SW¼ sec. 25, T. 23 N., R. 6 W. The deposit occurs in low areas in the floodplain of the Mackinaw River that probably are abandoned stream channels.

The nature of the peat in the old workings could not be determined, but at the center of the west line SW¼ sec. 25, 3 feet of black humus is exposed in a drainage ditch. In the NE¼ SE¼ NE¼ sec. 21, another drainage ditch showed the following:

	Depth (ft)
Soil, black (humus)	1½
Peat, medium brown, coarse textured, fibrous, with much material probably derived from wood	3
Silt, gray brown, rich in organic matter at the top; many small mollusk shells or pieces	2
Covered	

Waterman (1926), who was primarily interested in the ecology of peat bogs, mentioned a crescent-shaped bog at the west end of Cedar Lake but gave no further location. However, such a bog appears on the Antioch Quadrangle topographic map, near the center of the W½ W½ sec. 32, T. 46 N., R. 20 E. He also mentioned a "group of bogs northwest of Volo," a bog 3 miles southeast of Antioch, and the Sayer bog northwest of Volo, which is probably now known as the Volo bog or is located near it.

Kurz (1928), also interested in ecology, reported a bog on Duck Lake on the southern limits of Ingleside, but the exact location of the bog is not evident on current topographic maps, although there are bogs at the north and northeast ends of the lake.

Evers (1963) described bogs near Volo and Wauconda in Lake County and gave the size of the latter bog as about 67 acres.

BOTANICAL NATURE OF PEAT

Peat in Illinois occurs most commonly (Soper and Osbon, 1922) in grassy meadows and in grass-sedge and cattail marshes. The results of a study of the kinds of plants composing the peat in a number of bogs in northeastern Illinois are given in table 1. Waterman (1926), Kurz (1928), and Evers (1963) gave more detailed information on the plants in Lake County bogs.

The results of botanical identification of the coarse material remaining after partial maceration of the peat samples taken for the present study are given in table 2. The deposits sampled are described subsequently. The samples mentioned in the table are of interest in that they indicate the character of the deposit at the place sampled. However, they do not necessarily show the nature of the deposit as a whole.

THICKNESS OF PEAT

The maximum thickness of peat noted during the present study was about 15 feet. According to Soper and Osbon (1922), the thickness of peat

TABLE 2 - CHARACTER OF COARSE MATERIAL IN PEAT*†

Sample	County	Description
100	Whiteside	Sedge peat that contains about 50 percent brown, flaky pieces of decomposed organic matter
101	Whiteside	Similar to above
103	Whiteside	Mostly sedge peat but contains 30 to 40 percent moss
105	Lake	Sedge peat; very little decomposed organic material
106	Lake	Grayish brown, dense, rubbery material only partially disaggregated. Decomposed organic matter and diatoms
107	Lake	Sedge peat, well disaggregated and a small amount of flaky, decomposed organic matter
108	Lake	Similar to above but contains about 5 percent charcoal fragments
110	Lake	Sedge peat that contains about 50 percent flaky, decomposed organic matter
111	Lake	Sedge peat with a little decomposed organic matter
114	Kane	About 50 percent sphagnum moss, 40 percent sedges, and 10 percent decomposed organic matter

* Sources of samples are described under "Present Industry."
† Botanical identification by R. A. Peppers, 1969.

in Illinois ranges from 2 inches to 20 feet, but most deposits are less than 5 feet thick. The maximum reported thicknesses of peat are 33 feet in the Volo bog (Evers, 1963) in Lake County and 30 feet in the S½ sec. 29, T. 21 N., R. 4 E., Whiteside County (Carman, 1909).

ANALYSES

The samples described in table 1 were analyzed by Soper and Osbon (1922, p. 27) to determine their fuel value, and the results are given in table 3. Analyses of samples taken during the present investigation (table 4) provide information regarding their horticultural value. The samples do not necessarily typify the entire deposits from which they came.

TABLE 3 - ANALYSES OF MOISTURE-FREE PEAT AND MUCK*

County	Locality no.	Analysis no.	Proximate			Ultimate		Calorific value	
			Volatile matter	Fixed carbon	Ash	Sulphur	Nitrogen	Calories	British thermal units
Kankakee	2	317	41.19	29.22	29.59	2.39	3.03	3,786	6,814
Lake	3	300	61.20	23.66	15.14	1.14	3.84	4,528	8,150
	4	301	33.27	19.33	47.40	2.26	2.18	.....	.....
	5	302	57.47	20.79	21.74	2.43	2.85	4,309	7,756
	6	303	67.63	23.25	9.12	.52	2.52	4,909	8,837
	7	304	34.57	23.46	41.97	.67	2.45	.....	.....
	8	305	68.15	11.24	20.61	1.20	3.18	4,208	7,575
	9	306	58.67	30.72	10.61	.66	2.88	4,776	8,596
Mason and Tazewell	13	313	63.99	9.44	26.57	1.21	2.24	3,922	7.060
	14	314	34.83	26.05	39.12	.38	1.92	.....	.....
	14	315	62.70	2.96	34.34	.30	2.97	.....	.....
	14	316	37.17	27.48	35.35	.41	2.42	.....	.....
Whiteside	15	307	65.65	6.37	27.98	.36	2.66	3,759	6,766
	15	308	63.18	23.04	13.78	.27	3.23	4,564	8,215
	15	309	61.51	23.86	14.63	.27	3.30	4,609	8,296
	16	310	62.01	21.36	16.63	.49	2.52	4,702	8,464
	16	311	50.52	6.48	43.00	.39	2.05	.....	.....
	16	312	32.20	17.78	50.02	.56	1.48	.....	.....

* From Soper and Osbon, 1922, p. 27.

USES OF PEAT AND HUMUS

The principal uses for the peat found in Illinois are horticultural. It is used on lawns and gardens to add organic material to the soil and to make clayey soils more friable. Its water-holding capacity is also an asset. As a mulch, it serves to control weeds and conserve soil moisture. According to a California report (Calif. Div. Mines, 1956), requirements for peat for ordinary greenhouse use and for home garden purposes are as follows:

> ...peat should be free from hard lumps and from excessive salt or alkali. Peat with brittle stems and strawlike texture soon breaks down to form dust and is considered inferior. Peat materials that are even in texture, fibrous, and free from dirt and alkali salts

should prove satisfactory. Actual growing tests will help demonstrate the value of the different kinds and grades of peat.

Another major use for reed-sedge peat is in mixed fertilizers, in which the peat reduces caking and sticking by absorbing water and also serves as a filler. Peat that will pass a 5- to 10-mesh sieve and contains less than 10 percent moisture is normally used for conditioning fertilizer, according to Sheridan and DeCarlo (1957).

Peat also is used as bedding for livestock; packing material for plants, fruit, vegetables, eggs, fish bait, and fragile materials; filtering agents; dye stuff; and tanning substances (Calif. Div. Mines, 1956).

Humus is used primarily for horticultural purposes.

TONNAGE AND VALUE

The U. S. Bureau of Mines has published figures (Sheridan, 1968) on tonnage and value of peat production. In 1967, the last year for which

TABLE 4 - ANALYSES OF 1969 PEAT AND HUMUS SAMPLES ON AIR-DRIED BASIS*†‡

Sample	Material	CaO (%)	K_2O (%)	P_2O_5 (%)	Total carbon (%)	Nitrogen (%)	Ash (%)	pH
102	Peat	2.87	0.14	0.19	42.89	3.56	20.14	5.95
103	Peat	2.39	0.25	0.17	50.50	3.09	11.38	5.60
104	Peat	2.87	0.22	0.29	46.33	3.27	16.90	5.73
105	Peat	2.82	0.08	0.06	51.79	3.41	10.19	5.62
107	Peat	3.69	0.14	0.23	47.46	3.33	13.47	6.01
108	Peat	3.07	0.19	0.12	51.55	2.64	8.01	5.81
109	Peat	2.15	0.19	0.13	53.46	3.86	5.85	6.17
111	Peat and humus	4.30	0.40	0.15	42.10	2.50	22.98	6.11
112	Peat and humus	4.04	0.32	0.10	43.27	2.44	21.40	5.77
113	Humus	2.07	0.20	0.17	17.48	1.31	68.30	6.38
114	Peat	3.08	0.14	0.02	47.42	2.66	7.30	6.56

* Analyses by the Analytical Section of the Illinois State Geological Survey, 1969.

† Sources of samples described subsequently under "Present Industry."

‡ Moisture was not determined. It is probably the principal undetermined constituent.

complete figures are available, Illinois was the second largest peat producing state in the nation with a production of 49,716 tons that was valued at $697,000, or $14.01 per ton. These figures contrast with a 1960 production of 6179 tons valued at $27,947. Present Illinois production includes both peat and humus, sold in both bulk and packaged form. Original reserves of peat in Illinois were estimated at 10,000,000 short tons of air-dried peat (U. S. Bur. Mines, 1965, p. 649).

In the United States, soil improvement was the major use of peat in 1967, and 581,720 tons valued at $5,795,000, or about 94 percent of the tonnage, was used for this purpose. The rest of the peat produced, in order of tonnage, was used for potting soil, packaging plants and shrubs, in mixed fertilizers, seed inoculant, and mushroom beds (Sheridan, 1968, p. 3).

PEAT PRODUCTION AND PROCESSING

The stages in the production of peat are digging, drying, shredding, and bagging. Drag-line cranes, backhoes, or bulldozers are used for digging. The peat is spread on drying fields or put into piles or windrows to dry to a suitable moisture content. The peat in the drying fields and windrows is periodically turned by machines to facilitate drying. Some peat is sold in bulk, but most of it is shredded. Shredding and bagging are done by machine.

PRESENT INDUSTRY

The peat and humus industry of Illinois consists of seven operations, two in northwestern Illinois and five in northeastern Illinois (fig. 1). Brief descriptions follow.

Anderson Peat Company

SW¼ SE¼ SW¼ sec. 17, T. 21 N., R. 4 E., Whiteside County,
approximately 5½ miles west of Morrison.

The Anderson Peat Company operates near the center of an extensive peat bog in Cattail Valley, which is an abandoned channel of the Ancient Mississippi River (Frye, Willman, and Black, 1965).

Sample 107 (table 2) was taken from a pile of processed peat. Samples 100 and 101 were taken from a trench at depths of approximately 8 and 15 feet, respectively, below the probable original surface of the bog.

Markman Peat Company

SW¼ SE¼ sec. 29, T. 21 N., R. 4 E., Whiteside County,
approximately 5½ miles west of Morrison.

The Markman Peat Company, also located in Cattail Valley, is taking peat from a deposit about 15 feet thick.

Sample 103 (table 2) represents a 5-foot thickness of peat from 5 to 10 feet below the probable original surface of the bog; sample 104 was taken from the stock pile of mixed and shredded peat.

Grayslake Peat Company

NE¼ SE¼ NE¼ sec. 2, T. 44 N., R. 10 E., Lake County,
approximately 1 mile south-southeast of Grayslake on Illinois Route 83.

The peat at the Grayslake Peat Company varies in thickness, with a maximum of 14 feet.

Sample 105 (table 2) was taken from a pile that had been dug from a depth of 12 feet and sample 106 from a pile dug from a depth of approximately 18 feet at the bottom of the deposit.

Joseph Grenus Peat Company

SE¼ SW¼ sec. 20, T. 46 N., R. 10 E., Lake County,
immediately west of the village of Loon Lake.

The Joseph Grenus Peat Company deposit has a maximum thickness of 12 feet of peat under 1 foot of overburden. The peat is sold principally by the truck load.

Sample 107 (table 2) was taken 1 foot below the surface, sample 108 from a depth of 4 feet, sample 109 from a stock pile of peat that originally came from a depth of 8 feet, and sample 110 from a stock pile dug from a depth of 12 feet.

Root's Peat Farm

SE¼ SE¼ SE¼ sec. 35, T. 46 N., R. 10 E., Lake County,
2½ miles east of Lake Villa.

Root's Peat Farm produces both peat and humus from a deposit about 6 feet thick. Sample 111 (table 2) was taken from a pile of the raw product; sample 112 is the mixed and shredded product.

Louis Schachtner

SW¼ SW¼ SE¼ sec. 4, T. 43 N., R. 7 E., McHenry County,
4 miles north of Huntley on Illinois Route 47.

At the Louis Schachtner operation, humus is dug, stacked, and sold by the truck load. Sample 113 (table 2) was taken from a stock pile.

Batavia Soil Builders

SW¼ SW¼ sec. 19, T. 39 N., R. 8 E., Kane County,
approximately 2½ miles west of Batavia.

Batavia Soil Builders operates in a bog in which the peat is 4 feet thick.

Sample 114 (table 2) was taken from the bog at a depth of 2 feet.

SUMMARY

The peat and humus found in Illinois were formed by the accumulation of plant remains (especially reeds, sedges, and, less commonly, moss) in lakes that generally were the result, directly or indirectly, of glacial activity. In the course of time, the plant materials built up until they filled or nearly filled the lakes, thus converting them into bogs. Deposits are found at a number of places in Illinois, but those of greatest commercial importance occur in northeastern and northwestern Illinois, particularly in Lake, Whiteside, and Kane Counties.

Illinois peat was used locally as a fuel in northern Illinois near the middle of the 19th century, but it is no longer so used because other fuels are superior. The Btu value of 11 samples of Illinois peat ranges from 6766 to 8837, whereas a good grade of Illinois steam coal has a Btu value as received of 11,000 or more (W. H. Smith, personal communication, 1967).

Illinois peat and humus are used principally in horticulture. They add organic matter to soil and possess desirable water-holding properties. The amount of organic matter in 11 samples of Illinois peat and humus ranges from about 30 to 95 percent, as deduced from the amount of ash in the samples.

There are seven peat and/or humus producers in Illinois. In 1967, their output had a value of almost $700,000. Processing involves digging, air drying to a specified moisture content, shredding, and sacking.

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