PEAT DEPOSITS OF DISMAL SWAMP POCOSINS
CAMDEN, CURRITUCK, GATES, PASQUOTANK, AND PERQUIMANS COUNTIES
NORTH CAROLINA

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ABSTRACT

Peat is present in the Dismal Swamp of northeastern North Carolina and southeastern Virginia. In North Carolina the peat is in 4 separate deposits located west, northwest, and north of Elizabeth City. In a few infilled channels the peat is up to 12 ft thick but most of the peat lies in broad shallow depressions and increases in thickness from 0 ft at the margins to 6 to 8 ft in the interior of the deposits. The deposits in North Carolina occupy an area of 76,800 acres (120 sq mi) containing about 68 million tons of moisture-free peat. The deposits greater than 4 ft thick occupy an area of 34,700 acres containing about 43 million tons of peat.

The peat lies to the east of the Suffolk Scarp on the Pamlico Terrace. The surface elevation of the peat ranges from 15 to 20 ft.

Two main types of peat are present: (1) a brown, decomposed fibrous peat usually found at the base of the thicker peats, and (2) a black, fine-grained, highly decomposed peat that usually overlies the fibrous peat. Both peat types contain large amounts of wood.

The moisture content ranges from 40 to 94% with an average of about 81% and usually increases with depth and total thickness of the peat. Away from the margins and bottoms of the deposits, the average ash content is about 7%. Heat values for moisture-free, low ash peats range from 8700 to 10,900 Btu/lb with a median of 10,100. The sulfur content ranges from 0.2 to 0.7% with a median of 0.3%.

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I. INTRODUCTION

A survey was made of the North Carolina portion of the Dismal Swamp pocosins to determine the location, thickness, quality, and quantity of peat with ash content less than 25% and heating value greater than 8,000 Btu/lb. Peats found in stream flood plains and tidal marshes are not covered in this report.

A. Location

The Dismal Swamp is located on the lower Coastal Plain of southeastern Virginia and northeastern North Carolina. This report covers only the part that lies in North Carolina.

Peat is found in eastern Gates, northwestern Pasquotank, northern Camden, northwestern Currituck, and northeastern Perquimans counties (Pl. I). The deposits are located on eleven 7 1/2 minute orthophotographic quadrangles: Corapeake, Lake Drummond SW, Lake Drummond SE, Moyock, Beckford NE, Beckford SE, South Mills NE, South Mills NW, South Mills SE, South Mills SW, and Elizabeth City NW. Persons interested in the details of these deposits should obtain the above orthophotographic maps from the North Carolina Geological Survey, P.O. Box 27687, Raleigh, N.C. 27611, and enlarge Plate I to fit these maps.

The deposits lie northwest and north of Elizabeth City. Access to the deposits is by the state roads shown on Plate I and by numerous privately owned canal maintenance roads.

B. Methods

1. Field Methods

Soil maps were used as guides in locating potential peat deposits. All areas mapped as histosols (organic soils) were investigated. In areas where peat was found, samples were collected at one-foot vertical intervals using a Macaulay peat sampler, a Davis peat sampler, or a screw auger from the surface down into the underlying mineral sediment (sand or clay). Samples were collected at about 330 sites. Site locations were plotted on orthophotographic maps with scales of 1:24,000.

At selected sites, larger samples (about 1 pint) were collected for proximate and ultimate chemical analyses and for heating value determinations. At other selected sites, samples of known volume (200 cc) were taken with a Macaulay sampler for bulk density determinations.

2. Laboratory Methods

The moisture and ash content of nearly all samples (about 1400) were determined by heating about 10 g in 17 ml flat-bottom combustion crucibles at 105°C until dry (about 16 hours), and then by heating at 550°C until all organic material was burned (about 1 hour).

Samples for bulk density determination (moisture-free weight per unit volume) were collected with a Macaulay sampler with an inside diameter of 1 5/8 in. (4.13 cm). One-foot sections of the Macaulay core (200 cc) were placed in pre-weighed containers and then heated at 105°C to constant weight (about 3 days).

Proximate analyses (moisture, volatile matter, fixed carbon, and ash), ultimate analyses (carbon, hydrogen, oxygen, nitrogen, and sulfur), and heating values (Btu/lb) were made by the Coal Analysis Laboratory, U.S. Department of Energy, Pittsburgh, Pennsylvania.

II. TOPOGRAPHY AND DRAINAGE

Just west of the peat deposits and east of N.C. Highway 32 and County Road 1002 (Pl. I) is a north-south trending sand ridge with elevation of 40 to 50 ft. The eastern front of this sand ridge is the Suffolk Scarp with a toe elevation of about 20 ft. East of the Suffolk Scarp the Pamlico surface slopes gently eastward to elevations of 10 to 15 ft east of the pocosin peats. The pocosin peat deposits are on the Pamlico surface. Surface elevations of most of the peat deposits are from 15 to 20 ft.

Several small streams flow eastward down the Suffolk Scarp and disappear into the peat swamps.

The headwaters of several rivers (Northwest, North, Pasquotank, Little, and Perguimans Rivers) are located in the Dismal Swamp peats. These rivers either flow eastward into Currituck Sound or southward into Albemarle Sound.

Many miles of canals and ditches have been cut through the peat swamps. These canals and ditches increase the rate of surface run-off and lower the water table in the immediate vicinity of the canals. Because of the low hydraulic conductivity of the peat, however, the effect of the canals dies out rapidly away from them.

III. VEGETATION

Essentially all of the Dismal Swamp can be considered disturbed by man. The swamp forests of the Dismal Swamp, originally dominated by cypress (*Taxodium distichum*) and Atlantic white cedar (*Chamecyparis tyroides*), have been cut over numerous times. All that remains of this original ecosystem are scattered giant cypress trees that were unsuitable for cutting.

The extensive cutting, in addition to the construction of numerous drainage and barge canals, has changed the character of most of the Dismal

Swamp. The greatest change appears to be the result of drainage. With more rapid removal of surface water, large areas that were originally inundated for significant portions of the year are now subaerially exposed for sufficient lengths of time, during the right seasons of the year, to permit a less hydrophytic forest system to develop.

A variety of forest types now exist in the Dismal Swamp. Of these, five are most abundant: (1) pond pine forest and woodland, (2) red maple forest, (3) mixed wetland hardwood forest, (4) Atlantic white cedar forest, and (5) cypress-gum forest. The distribution of these five major vegetation types is complicated; however, a general pattern does appear to exist. The pond pine woodland and forest systems are best developed along the eastern and southern edges of the swamp, in areas farthest from the effects of drainage off the Suffolk Scarp, which forms the western border of the swamp. The red maple forest system occurs in areas that have been intensely cutover and drained. The mixed wetland hardwood forest system is best developed around Lake Drummond and over thick peat along the eastern half of the swamp between US 15 and SSR 1001. The Atlantic white cedar forests are over thick peat, in the center of the swamp, usually in the older, natural drainage areas. The cypress-gum forests are found over the high ash peats along the base of the Suffolk Scarp, in what appears to be the wettest part of the swamp.

IV. PEAT RESOURCES

A. Geographic Distribution

In the North Carolina part of the Dismal Swamp, peat is found in 4 areas that are physically separated from each other: A - the Northeast deposit, B - the Northwest deposit, C - the Large Southwest deposit, and D - the Small Southwest deposit (Plate I).

B. Peat Types

Two main types of peat are present: (1) an upper dark brown to black, fine-grained, highly decomposed humic peat, and (2) a lower brown, decomposed humic fibrous peat.

The humic peat dominates the upper 5 to 6 ft of peat. As collected in the field this peat appears to have very little megascopic plant debris. When wet-sieved through a 0.5 mm sieve, however, the peat is seen to contain a fair amount of wood fibers.

The brown fibrous peat is usually found beneath the black humic peat in the deeper parts of the relatively narrow peat-filled channels and the basal portions of the broad, basin-like low areas. The contact between the humic and fibrous peat is gradational.

Both peat types contain large amounts of wood in the form of fallen logs and stumps. The wood seen in the numerous canals is mainly Atlantic white cedar and cypress. This wood is most concentrated in the thicker peat, except for the basal 3 ft in the deepest channel where the peat is relatively wood-free. Except for these channel areas, wood can be found from the base of the peat to the ground surface.

The peat at depths below 8 ft, found mainly in the deeper portions of filled stream channels, differs from the rest of the peat in two ways: the wood content is much lower, and the ash content is higher. This deep peat contains a relatively high clay content and represents the initial stage of peat accumulation in low-lying, blocked streams.

The contact between the peat and the underlying mineral sediment is usually a transitional one with the transition zone normally being less than a foot thick although at places it may be 2 or 3 ft thick. On a moisture-free basis, the basal foot of peat averages 11% ash whereas the next underlying foot averages 69% ash.

C. Composition and Heating Value

Table 1 summarizes and the Appendix gives details of the proximate and ultimate analyses of Dismal Swamp peats.

TABLE 1--Summary of Composition and Heating Values of Dismal Swamp Peats (59 samples with less than 10% ash)

	Low	Median	High
BTU/LB*	8700	10,100	10,900
% H_2O**	40	81	94
PROXIMATE ANALYSIS*			
% Volatiles	55	62	67
% Fixed Carbon	27	33	36
% Ash	2	5	10
ULTIMATE ANALYSIS*			
% C	54	59	62
% H	4.9	5.5	6.3
% O	26	29	30
% N	1.1	1.7	2.6
% S	0.2	0.3	0.7
% Ash	2	5	10

* Moisture-free basis

** 1391 samples

1. Moisture

For 1400 samples, the moisture content ranged from 40% to 94% with an average of 80.7% (Table 2). The moisture content is related to 4 variables: (1) depth, (2) total thickness of the peat, (3) distance from drainage ditches, and (4) precipitation and evapotranspiration.

Although there is much variation, the moisture content in general increases with depth, from an average of about 70% in the first foot to about 90% at depth greater than about 5 ft. (Tables 2 and 3 and Fig. 1).

TABLE 2--Relation of Moisture Content to Depth of Dismal Swamp Peats

Depth	Low	Mean	High	No. Samples
0-1 ft	39%	71.3%	90%	279
1-2	60	77.8	91	256
2-3	59	83.0	90	219
3-4	71	86.3	94	172
4-5	68	88.3	94	115
5-6	71	89.0	93	74
6-7	85	89.3	92	29
7-8	84	89.0	92	10
8-9	85	87.3	92	5
9-10	—	87.7	—	1
10-11	—	88.1	—	1
				1161 total

Mean of 1161 moisture determinations - 80.7%

TABLE 3--Mean Moisture Percentage of Dismal Swamp Peats related to Depth and Total Thickness of Peat

Depth (ft)	Total Peat Thickness (ft)										
	1	2	3	4	5	6	7	8	9	11	Mean
0-1	70.8	71.1	71.4	71.9	72.4	66.9	70.6	76.3	69.2	63.5	70.4
1-2		77.0	77.5	78.8	78.2	73.7	78.2	80.9	76.1	79.2	77.7
2-3			81.3	83.6	83.5	83.4	82.5	85.9	83.5	80.9	83.1
3-4				85.7	86.4	85.4	89.9	88.9	87.3	85.7	87.0
4-5					87.6	88.1	89.8	89.2	89.7	88.7	88.9
5-6						88.6	89.5	89.4	91.0	89.6	89.6
6-7							88.9	89.5	90.4	90.8	89.9
7-8								89.2	88.5	90.3	89.3
8-9									89.2	89.9	89.6
9-10										87.7	87.7
10-11										88.1	88.1
Mean	70.8	74.0	76.7	80.0	81.7	81.0	84.1	86.2	85.0	85.0	

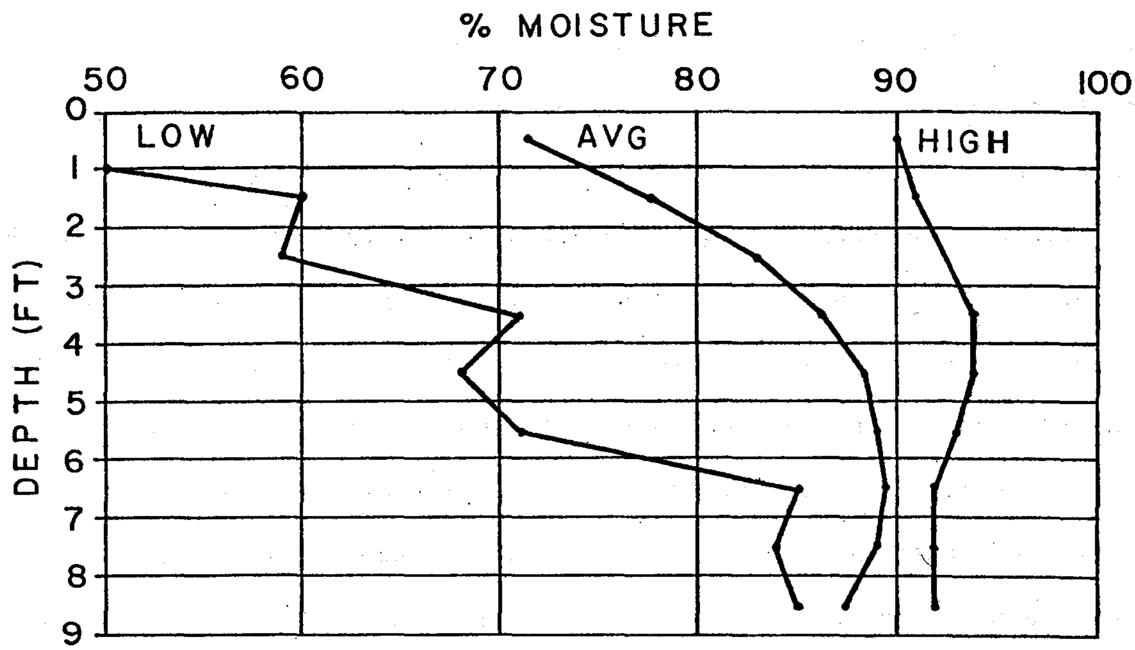

FIG. 1--Relation of moisture content to depth of Dismal Swamp peats.

The total thickness of peat may have some control over the moisture content. The average moisture content increases from 71% where the peat is 1 ft thick to 85% where the peat is 11 ft thick (Table 3). This relationship, however, may merely be a restatement of the relation of moisture content to depth. At any given depth in the Croatan Forest peats, the water content increases in going from thin to thick peat. This relationship is not apparent in the Dismal Swamp (Table 3). This difference between Croatan Forest and Dismal Swamp may be related to differences in vegetation patterns. Most of Dismal Swamp supports a swamp forest ecosystem. Differences in the distribution of plant species do exist, but it is possible that overall evapotranspiration may be relatively uniform throughout the swamp regardless of peat thickness. In the Croatan Forest, however, the thinner peats support pond pine forests, whereas the thicker peats are covered with a low pocosin ecosystem and sphagnum. Possibly the taller and denser vegetation on the shallow peats transpire more water from the peat than the low pocosin vegetation and sphagnum.

Near drainage ditches and canals the top 2 or 3 ft has a lower moisture content than peat away from ditches and canals. The effect of drainage, however, dies out rapidly away from the ditches.

The lower and more variable moisture content of the top 3 to 5 ft (Table 2 and Fig. 1) is probably related to flucuations in the water table as the result of changing relationships between precipitation and evapotranspiration and the irreversible collapse of capillary openings as water is removed from the peat. The change in water content at 3 to 5 ft probably represents the maximum lowering of the water table. Once partially dehydrated, the peat apparently cannot fully rehydrate.

The moisture content of the peats also varies with the season, being higher in winter than in summer. Most of the samples were collected in May and June, 1979 and 1980, but some were collected in January and October of 1980. Figure 2 shows the variation in moisture content with the time of collection. The moisture content is highest in January, lowest in October, and intermediate in May and June. The changing rate of evapotranspiration is probably the major factor controlling this seasonal change. During January and the other winter months when temperatures are low and most of the swamp vegetation is dormant, evapotranspiration is low and the water content of the peat can be replenished. In May and June, evapotranspiration increases which lowers the moisture content. Evapotranspiration is at a maximum in summer and early fall at which time the moisture content of the peat is lowest.

Other peat properties also change with these seasonal changes in moisture content. The volume of the peat changes as was shown by the fact that sites over thick peat that were sampled in both June and in October showed changes in peat thickness up to 1 to 2 ft. The bulk density also changes seasonally as the moisture content changes.

2. Ash

For about 1100 samples with ash content less than 25%, the mean ash content is 7.3% on a moisture-free basis. Away from the margins and base of the peat bodies, ash contents of about 5% are most common. Table 4 shows the mean ash percentages of all samples analyzed as related to total thickness of the peat and depth.

For peats less than 6 or 7 ft thick, there is usually a transition zone about a foot thick between the peat and the underlying mineral sediment (sand or sandy clay). For peats thicker than 6 or 7 ft, the transition zone may be 2 to 4 ft thick. The ash content is also higher around the margins of the deposits. The first foot of mineral sediment under the peat averages 69% ash

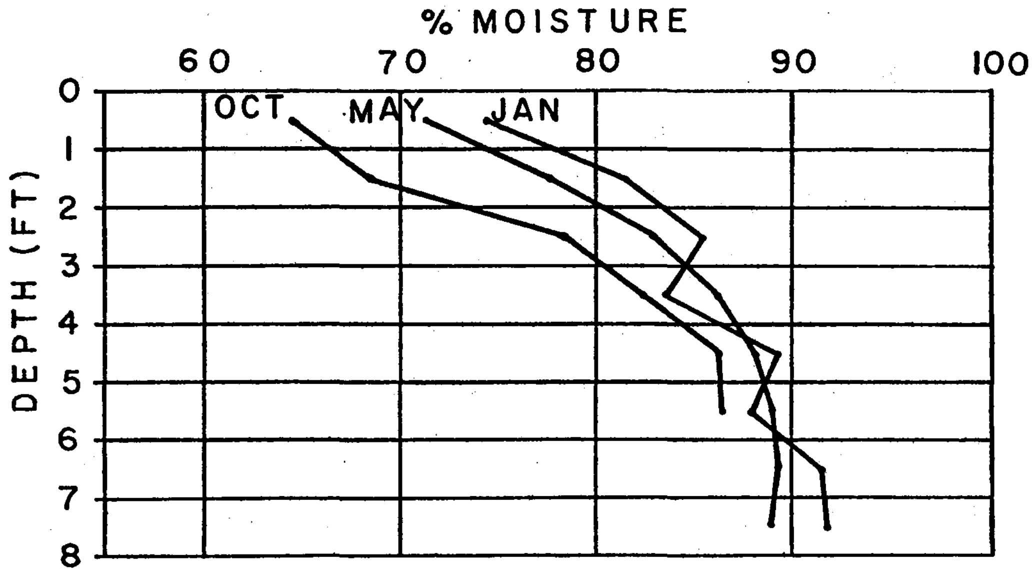

FIG. 2--Relation of moisture content to seasons of Dismal Swamp peats. Shows moisture content of samples collected in October, 1980; May-June, 1979 and 1980; and January, 1980.

while the basal foot of peat averages 11% ash. The second foot of peat above the mineral sediment averages 8% ash; and, except for the top foot, the rest of the peat averages 5% ash. The top foot averages 10% ash. The higher ash content of the surficial foot may be due to the development of agriculture in the area, resulting in increased influx of mineral sediment from surrounding areas during times of high water runoff or from strong winds.

TABLE 4--Mean Ash Percentage of Dismal Swamp Peat related to Depth and Thickness of Peat

Depth (ft)	Total Peat Thickness (ft)										
	1	2	3	4	5	6	7	8	9	11	Mean
0-1	16.6	12.8	8.4	9.4	8.9	7.1	7.5	10.1	10.0	12.7	10.4
1-2	50.9	10.5	4.4	6.1	5.6	4.2	4.0	7.5	3.6	6.8	5.9
2-3		73.4	7.1	5.3	7.2	4.6	3.6	4.0	5.1	6.1	5.4
3-4			79.0	7.7	5.6	4.9	3.1	3.3	3.4	4.1	4.6
4-5				67.2	8.7	7.7	5.3	4.1	4.8	4.0	5.8
5-6					67.8	10.1	8.3	7.9	7.8	6.2	8.1
6-7						72.9	14.0	10.9	13.0	9.7	11.9
7-8							68.4	16.2	9.9	13.4	13.2
8-9								43.5	9.6	30.4	20.0
9-10									74.6	20.0	20.0
10-11										18.3	18.3
11-12										85.6	
Mean	16.6	11.6	6.6	7.1	7.2	6.4	6.5	8.0	7.5	12.0	11.2 / 9.0

3. <u>Heating Values</u>

The heating value of 71 samples was determined (Appendix). Within the main bodies of peat where the ash content is less than 10%, the Btu/lb range from 8,700 to 10,900 with a median of 10,100 (Table 1). As the peat becomes diluted with ash components, the heating value declines; but all peats with less than 25% ash have heating values greater than 8,000 Btu/lb.

4. Proximate Analyses (See Table 1 and Appendix)

For the peats with less than 10% ash, the volatile matter ranges from 55 to 67% with a median of 62%; and the fixed carbon ranges from 27 to 36% with a median of 33%. Both volatile matter and fixed carbon decrease as the ash increase.

5. Ultimate Analyses (See Table 1 and Appendix)

The major elements (carbon, hydrogen, and oxygen) in the peat decrease as ash increases. For peats with less than 10% ash, the carbon content ranges from 54 to 62% with a median of 59%; the hydrogen content ranges from 4.9 to 6.3% with a median of 5.5%; and the oxygen content ranges from 26 to 30% with a median of 29%.

The amount of potential environmental pollutants (nitrogen and sulfur) is independent of ash content. The nitrogen content ranges from 1.1 to 2.6% with a median of 1.7%. The sulfur content ranges from 0.2 to 0.7% with a median of 0.3%. The sulfur content is highest in the basal parts of the peats that are greater than 6 ft thick.

D. Quantity of Peat

In order to calculate the amount (weight) of peat present, the volume of peat must be multiplied by the bulk density (moisture-free weight per unit volume). Volumes were calculated from isopach maps on a scale of 1:24,000. Areas, determined with a Lasico Model L1250 D Rolling disc planimeter, were multiplied by average thicknesses between isopach lines (lines connecting points of equal thickness) to obtain volumes.

1. Bulk Density

The accuracy of the calculation of the weight of peat depends on the accuracy of the bulk density used. Unfortunately, the bulk density of peat is highly variable, but some kind of average must be determined in order to calculate reserves.

Bulk density is controlled mainly by the moisture content of the peat and is subject to all the variables controlling the moisture content: depth, total thickness of peat, distance from drainage ditches, and precipitation - evapotranspiration balance.

At 52 sites in 7 different pocosin deposits of eastern North Carolina bulk densities were determined in triplicate for each one-foot interval to the base of the peat. The results are summarized in Table 5. Three trends are apparent: (1) bulk density decreases with depth, (2) mean bulk density decreases as peat becomes thicker, and (3) for any given depth and for any given thickness, bulk densities are extremely variable. As a guide for estimating bulk densities for the Dismal Swamp deposits, mean values for peats of varying thickness are shown in Column B, Table 6.

At 19 sites in the Dismal Swamp bulk densities were determined. Mean values are shown in Column C, Table 6. These values are distinctly lower than those for all pocosin samples probably because of non-random sampling and the extreme variability of bulk densities as shown in Table 5.

When bulk density is plotted against moisture content, an almost linear relation is revealed. Figure 3 shows this relationship for over 400 samples taken for all North Carolina peats. The points that fall distinctly below the lines are mainly for samples taken at depths less than 3 ft. Since we have many more moisture determinations than bulk density determinations, we feel that bulk densities based on average moisture content and Figure 3 come

TABLE 5 -- Bulk Density of North Carolina Pocosin Peats related to Depth and Thickness of Peat
(Mean bulk density in moisture-free tons per acre-ft with standard deviation. Number of samples in parentheses. A total of 620 samples from 52 sites.)

Depth (ft)	Total Peat Thickness (ft)											
	1	2	3	4	5	6	7	8	9	10	> 10	Mean
0-1	—	—	219±37 (5)	179±23 (5)	—	146±13 (4)	—	—	—	—	—	181±37
1-2		—	253±26 (16)	206±38 (21)	192±42 (15)	171±30 (9)	134±16 (9)	162±33 (7)	148±35 (3)	161±19 (3)	88±18 (6)	168±46
2-3			280±94 (17)	261±52 (25)	195±60 (27)	193±45 (16)	162±34 (11)	177±40 (15)	143±31 (3)	143±31 (3)	91±17 (9)	183±59
3-4				274±83 (25)	191±55 (27)	191±57 (19)	153±29 (12)	183±35 (15)	123±16 (3)	179±19 (3)	95±27 (9)	174±53
4-5					175±45 (25)	176±42 (19)	141±23 (12)	190±50 (15)	90±1 (2)	158±6 (3)	108±20 (9)	148±37
5-6						178±40 (22)	152±22 (12)	167±42 (15)	89±12 (3)	144±31 (3)	108±15 (9)	140±35
6-7							151±22 (15)	163±40 (15)	113±8 (3)	154±19 (3)	95±18 (9)	135±30
7-8								177±66 (15)	111±1 (3)	189±5 (3)	99±11 (9)	144±46
8-9									108±2 (3)	153±13 (3)	103±13 (8)	121±28
9-10										155±7 (3)	103±12 (9)	129±37
> 10											120±16 (28)	120
Mean	est. 275	est. 275	251±31	230±45	189±8	176±17	147±11	172±11	119±23	160±14	100±10	150 / 190

closest to the true bulk densities (Table 6, Columns D and E). Considering all available data, our best estimates of bulk density are shown in Column F, Table 6.

TABLE 6--Data for Determination of Bulk Densities of Dismal Swamp Peats

A	B	C	D	E	F
Thickness of Peat	Mean Bulk Density. All N.C. pocosins	Mean Bulk Density. Dismal Swamp	Mean Moisture Content fr. Table 3	Bulk Density fr. H_2O-Density Curve (Fig. 3)	Bulk Density (Best Estimate)
ft	tons/acre-ft*	tons/acre-ft*	%	tons/acre-ft*	tons/acre-ft*
0-2	275	——	72.4	350	300
2-4	240	192	78.4	300	270
4-6	180	152	81.4	260	220
6-8	160	146	85.2	210	190
8-10	140	137	85.0	210	180

* Moisture-free basis
B - From Table 5
C - 19 sites, 215 samples
D - 1160 samples

2. <u>Peat Reserves</u>

Plate I shows the location, size, and variations in thickness of the peat deposits of the Dismal Swamp in North Carolina. Calculated reserves are shown in Table 7. The combined deposits occupy an area of 76,800 acres (120 sq mi) and contain 68 million tons of moisture-free peat. The peat greater than 4 ft thick occupies an area of 34,700 acres (54 sq mi) with 43 million tons of peat.

E. Origin of Peat

Following the retreat of the sea that formed the Suffolk Scarp, broad shallow depressions on a relatively flat surface (the Pamlico Terrace) were

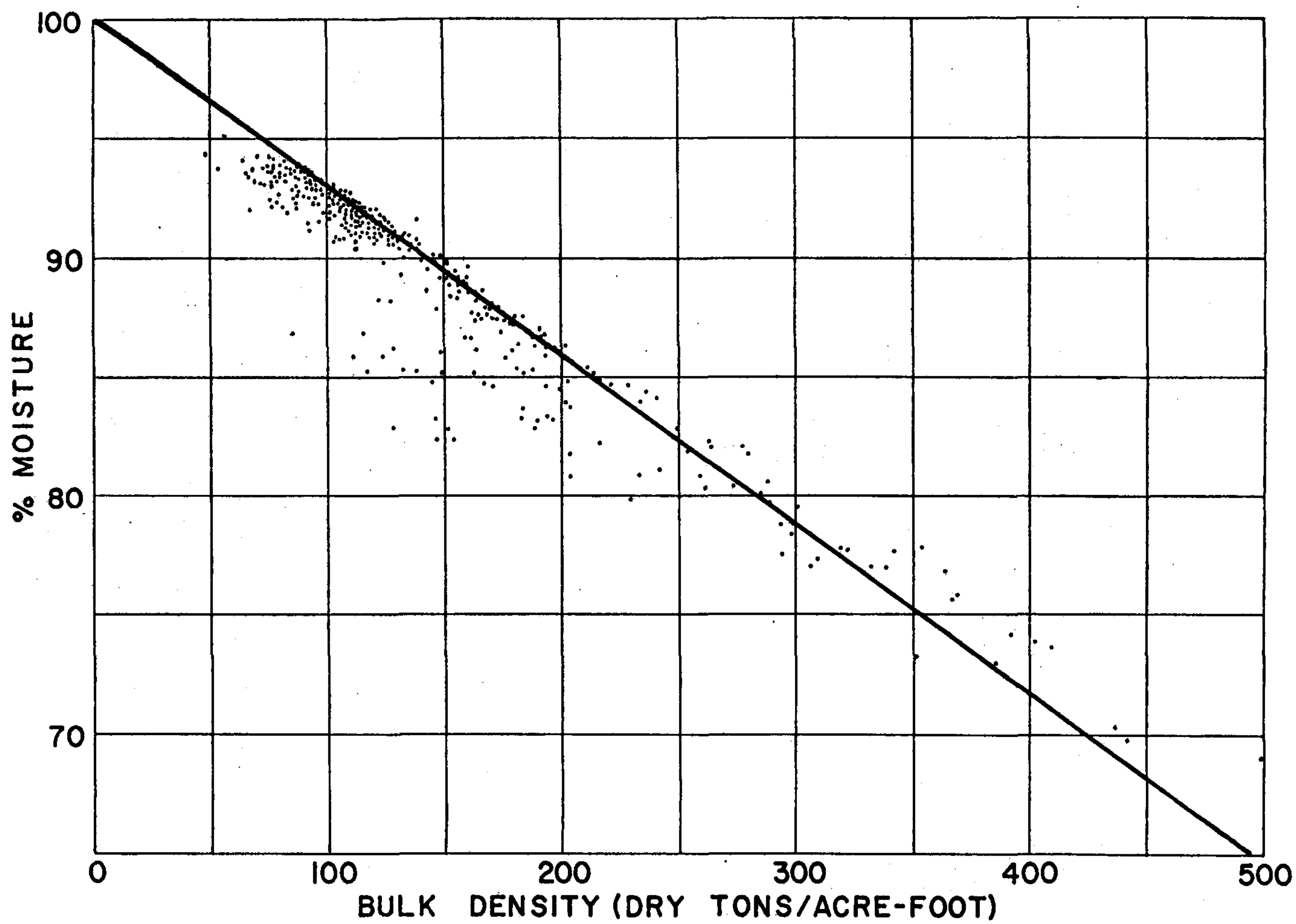

FIG. 3--Bulk density - moisture relationship of North Carolina peats.

TABLE 7--Peat Reserves in North Carolina
Part of Dismal Swamp Pocosins

Thickness ft.	Area acres	Weight 10^6 tons (moisture-free)
A. the Northeast Deposit		
> 0	14,230	11.40
> 2	9,470	9.98
> 4	5,770	6.98
> 6	2,180	3.03
> 8	450	0.73
> 10	0	0
B. the Northwest Deposit		
> 0	29,870	31.33
> 2	26,530	30.33
> 4	17,640	23.13
> 6	11,130	15.97
> 8	3,970	6.44
> 10	50	0.09
> 12	0	0
C. the Large Southwest Deposit		
> 0	30,580	23.86
> 2	20,590	20.87
> 4	11,150	13.32
> 6	4,150	5.52
> 8	0	0
D. the Small Southwest Deposit		
> 0	2,160	1.18
> 2	1,040	0.84
> 4	0	0
E. TOTAL		
> 0	76,840	67.77
> 2	57,630	62.02
> 4	34,660	43.43
> 6	17,460	24.52
> 8	4,420	7.61
> 10	50	0.09
> 12	0	0

exposed. This surface was then dissected by stream erosion resulting in a dendritic pattern of stream valleys. Initial peat development began in shallow lakes and open freshwater marshes as the result of blockage of the streams 10,000 to 12,000 years ago (Whitehead, 1972; Whitehead and Oaks, 1979; Oaks and Whitehead, 1979). The fibrous peat, which appears to have been formed from a variety of types of aquatic vegetation, accumulated in the shallow water and marshes. The blocked channels became filled with peat, and flooding of the low-lying adjacent areas began. This flooding created a large, flat wetland on which a swamp forest became established and in which the vegetation, that eventually became the black humic peat, accumulated. As a result of this sequence of events, black humic peat overlies the brown fibrous peat. The warm humid climate of the area has resulted in peat vegetation becoming decomposed to highly decomposed.

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Oaks, R. Q. and Whitehead, D. R., 1979, Geologic setting and origin of the Dismal Swamp, southeastern Virginia and northeastern North Carolina, p. 1-24, in P. W. Kirk, ed. The Great Dismal Swamp: Charlottesville, University Press of Virginia, 427 p.

Whitehead, D. R., 1972, Developmental and environmental history of the Dismal Swamp: Ecol. Mongr., v. 42, p. 301-315.

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APPENDIX

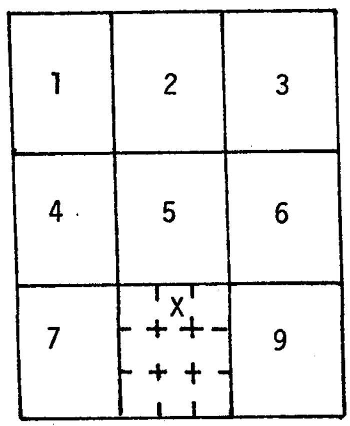
PROXIMATE AND ULTIMATE ANALYSES

OF

DISMAL SWAMP PEATS

Arranged alphabetically by topographic quadrangle

Location on a topographic quadrangle is given by the following scheme:



Location of X is 8-2

					Moisture Free								
Site No. (Depth-ft)	County	Topographic Quad.		H_2O %	Volatile %	Fixed Carbon %	Ash %	H %	C %	N %	S %	O %	BTU/lb
D7 (0-2)	Gates	Beckford NE:	6-6	82.9	60.8	30.5	8.7	5.9	56.4	1.7	0.4	26.9	9870
(2-4)				87.2	63.6	30.9	5.5	6.2	58.4	1.7	0.4	27.8	10270
(4-6)				91.1	57.3	32.6	10.1	5.4	55.8	2.1	0.4	26.3	9700
D21 (0-2)	Gates	Beckford NE:	9-3	80.3	65.6	26.5	8.0	6.3	56.2	1.8	0.3	27.4	10070
(2-4)				86.1	65.5	31.1	3.4	5.9	59.7	1.7	0.3	28.9	10340
(4-6)				89.6	59.2	28.9	11.9	5.6	54.3	2.3	0.6	25.2	9330
D138 (0-2)	Camden	Corapeake:	6-8	78.6	66.0	29.5	4.5	5.9	58.8	1.8	0.3	28.8	10500
(2-4)				87.4	63.5	33.3	3.2	5.2	60.9	1.7	0.3	28.7	10280
(4-6)				91.7	60.3	34.1	5.6	5.4	58.5	2.3	0.4	27.8	9700
(6-7)				91.0	54.9	32.9	12.2	5.0	55.2	2.4	0.6	24.7	9540
D133 (0-2)	Gates	Corapeake:	9-8	68.8	63.5	25.6	10.9	5.6	52.9	2.3	0.4	27.9	9400
(2-4)				83.8	65.2	30.7	4.1	5.8	60.1	2.1	0.4	27.5	10500
(4-6)				89.8	64.4	30.1	5.5	6.1	59.0	1.9	0.4	27.0	10240
(6-8)				90.0	55.7	34.3	10.0	5.2	56.1	2.2	0.7	25.9	9770
101 (0-2)	Currituck	Elizabeth City NW:	2-7	81.8	62.5	34.3	3.2	5.4	60.9	1.1	0.2	29.3	10420
(2-4)				86.9	61.8	35.5	2.7	5.1	59.7	1.8	0.3	30.4	10020
(4-6)				89.5	61.4	35.1	3.5	5.2	59.7	2.1	0.3	29.2	10060
(6-8)				88.8	55.7	31.8	12.5	4.8	53.5	2.0	0.4	26.9	9160
D150 (0-2)	Camden	Lake Drummond:	4-8	80.6	63.9	31.1	5.0	5.5	57.6	1.7	0.3	29.9	9880
(2-4)				86.2	64.4	32.9	2.7	5.8	60.2	1.4	0.3	29.6	10490
(4-6)				88.3	62.5	34.2	3.3	5.4	60.3	1.6	0.3	29.1	10380
(6-8)				91.0	54.4	32.3	13.3	6.1	52.9	2.1	0.4	25.4	9080

					Moisture Free								
Site No. (Depth-ft)	County	Topographic Quad.		H_2O %	Volatile %	Fixed Carbon %	Ash %	H %	C %	N %	S %	O %	BTU/lb
D177 (0-2)	Camden	Lake Drummond:	5-9	66.2	64.8	30.8	4.4	5.8	57.8	1.4	0.2	30.4	9990
(2-4)				81.1	63.9	34.0	2.1	5.6	60.7	1.2	0.3	30.1	10420
(4-6)				87.6	62.3	33.6	4.1	5.4	59.1	1.6	0.2	29.5	10090
D174 (0-2)	Camden	Lake Drummond:	6-8	77.6	61.7	34.6	3.7	5.3	59.8	1.5	0.2	29.5	10130
(2-4)				83.3	61.9	33.8	4.3	5.8	58.7	1.4	0.2	29.5	10090
D132 (0-2)	Pasquotank	Lake Drummond:	7-7	82.2	64.0	31.4	4.6	5.8	59.2	1.9	0.4	28.0	10380
(2-4)				88.6	63.5	32.6	3.9	6.1	59.9	1.9	0.4	27.7	10330
(4-6)				91.1	59.4	33.9	6.7	5.5	58.0	2.4	0.4	27.0	10050
(6-7)				91.4	57.2	31.1	11.7	5.3	55.4	2.4	0.8	24.3	9550
D156 (0-2)	Camden	Lake Drummond:	8-8	66.5	64.4	29.5	6.1	5.5	56.6	1.7	0.2	29.8	9870
(2-4)				76.4	64.3	31.0	4.7	5.7	58.0	1.6	0.2	29.8	10040
(4-6)				90.2	57.6	34.4	8.0	5.0	55.9	1.8	0.2	29.2	9250
93 (0-2)	Camden	South Mills NE:	3-3	84.6	58.5	35.5	6.0	5.0	58.4	2.1	0.3	28.2	9870
(2-4)				85.3	50.4	38.8	10.8	4.2	56.4	2.2	0.3	26.0	9260
(4-6)				82.9	30.9	22.5	46.6	2.6	32.7	1.5	0.5	16.1	5280
279 (0-2)	Gates	South Mills NW:	1-4	79.3	61.6	30.9	7.5	5.3	56.7	2.3	0.3	27.9	9840
(2-4)				87.4	65.3	30.9	3.8	6.0	61.2	2.0	0.5	26.6	10820
(4-6)				82.2	27.4	17.6	55.0	2.6	27.2	1.4	0.4	13.4	4470
D122 (0-2)	Pasquotank	South Mills NW:	1-6	83.0	63.7	33.2	3.1	6.1	60.4	1.4	0.3	28.6	10590
(2-4)				86.9	62.5	34.0	3.5	6.2	60.2	1.5	0.3	28.2	10460
(4-6)				89.0	57.0	35.4	7.6	5.5	57.2	1.6	0.3	27.8	9900

Site No. (Depth-ft)	County	Topographic Quad.	H_2O %	Moisture Free: Volatile %	Fixed Carbon %	Ash %	H %	C %	N %	S %	O %	BTU/lb
262 (0-2)	Gates	South Mills NW: 4-7	72.8	61.9	30.4	7.7	5.3	56.8	2.2	0.3	27.7	9780
(2-4)			82.1	62.5	32.6	4.9	5.4	58.5	2.1	0.3	28.8	9980
(4-6)			86.7	57.8	34.4	7.8	5.0	58.3	2.4	0.5	26.0	9910
255 (0-2)	Gates	South Mills NW: 7-2	65.2	65.1	30.0	4.9	5.9	58.2	2.1	0.3	28.8	10210
(2-4)			85.0	62.0	35.0	3.0	5.4	60.8	1.7	0.3	28.9	10330
(4-6)			91.8	59.2	34.6	6.2	5.1	58.7	2.6	0.4	27.0	10000
264 (0-2)	Gates	South Mills NW: 7-4	60.3	63.1	30.6	6.3	5.3	56.2	2.3	0.3	29.7	9590
(2-4)			75.7	61.7	33.4	4.9	5.2	58.4	2.3	0.3	28.9	9920
(4-6)			76.3	61.1	32.3	6.6	5.3	57.8	2.4	0.3	27.3	9920
D34 (0-2)	Pasquotank	South Mills NW: 8-4	81.0	66.5	28.3	5.2	5.9	57.4	1.9	0.3	29.2	10120
(2-4)			86.9	64.7	32.6	2.7	5.6	61.1	1.4	0.3	29.0	10540
(4-6)			88.9	55.9	30.7	13.4	5.2	53.8	2.0	0.3	25.2	9210
163 (0-2)	Pasquotank	South Mills SE: 1-7	76.2	61.1	34.5	4.4	5.1	58.7	1.6	0.2	30.0	9790
(2-4)			86.1	64.3	32.2	3.5	5.8	61.0	1.4	0.2	28.1	10590
(4-6)			92.7	56.6	34.0	9.4	4.9	55.4	1.9	0.3	28.1	8660
160 (0-2)	Pasquotank	South Mills SE: 4-4	78.2	62.1	28.9	9.0	5.4	55.8	2.2	0.3	27.3	9720
(2-4)			88.3	62.1	33.5	4.4	5.1	59.5	1.8	0.3	28.9	10220
(4-6)			87.5	41.9	25.7	32.4	3.6	41.7	1.9	0.3	20.0	6920
D41 (0-2)	Pasquotank	South Mills SW: 3-1	64.9	59.1	31.3	9.6	5.3	54.6	1.7	0.2	28.6	9330
(2-4)			85.7	64.4	33.2	2.4	5.9	61.4	1.3	0.2	28.8	10620

Site No. (Depth-ft)		County	Topographic Quad.		H_2O %	Moisture Free: Volatile %	Fixed Carbon %	Ash %	H %	C %	N %	S %	O %	BTU/lb
D50	(0-2)	Pasquotank	South Mills SW:	3-1	85.5	64.5	30.8	4.7	5.9	60.1	1.4	0.2	27.6	10540
	(2-4)				88.2	65.9	31.9	2.2	5.9	60.8	1.3	0.2	29.6	10480
174	(0-2)	Pasquotank	South Mills SW:	3-4	61.1	59.0	31.6	9.4	5.0	53.8	1.4	0.2	30.2	8930
	(2-4)				82.3	65.4	31.0	3.6	5.8	62.1	1.2	0.2	27.1	10920
	(4-6)				86.6	63.3	32.7	4.0	5.7	60.4	1.3	0.2	28.4	10220
D78	(0-2)	Pasquotank	South Mills SW:	5-6	80.3	60.7	32.3	7.0	5.8	57.6	1.7	0.2	27.6	10140
	(2-4)				89.7	60.9	35.1	4.0	5.5	58.7	1.5	0.2	30.1	10160
	(4-6)				92.7	55.1	36.4	8.5	5.1	56.0	1.9	0.3	28.2	9570