U.S. DEPARTMENT OF THE INTERIOR
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Dr. Eugene L. Boudette, State Geologist

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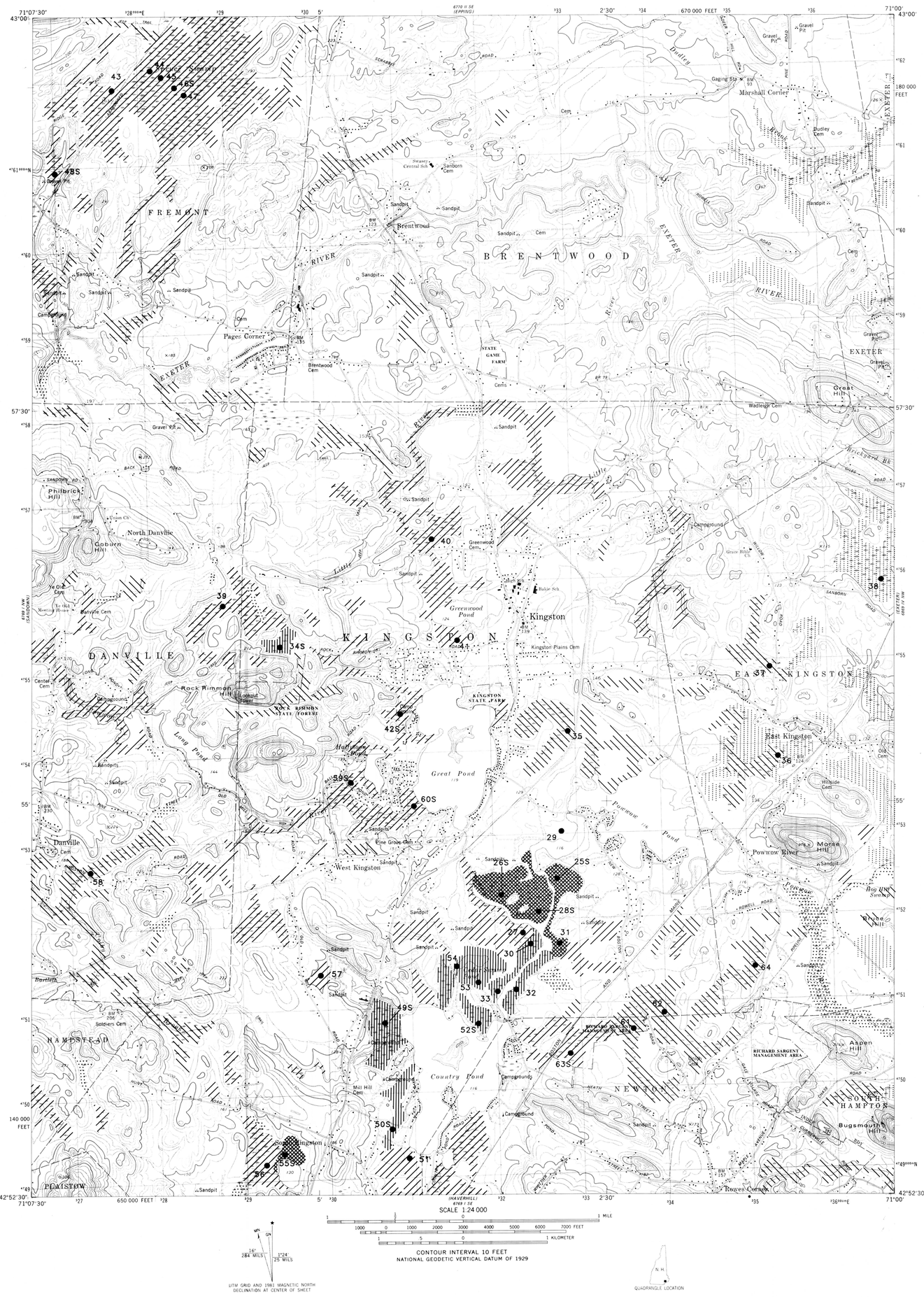
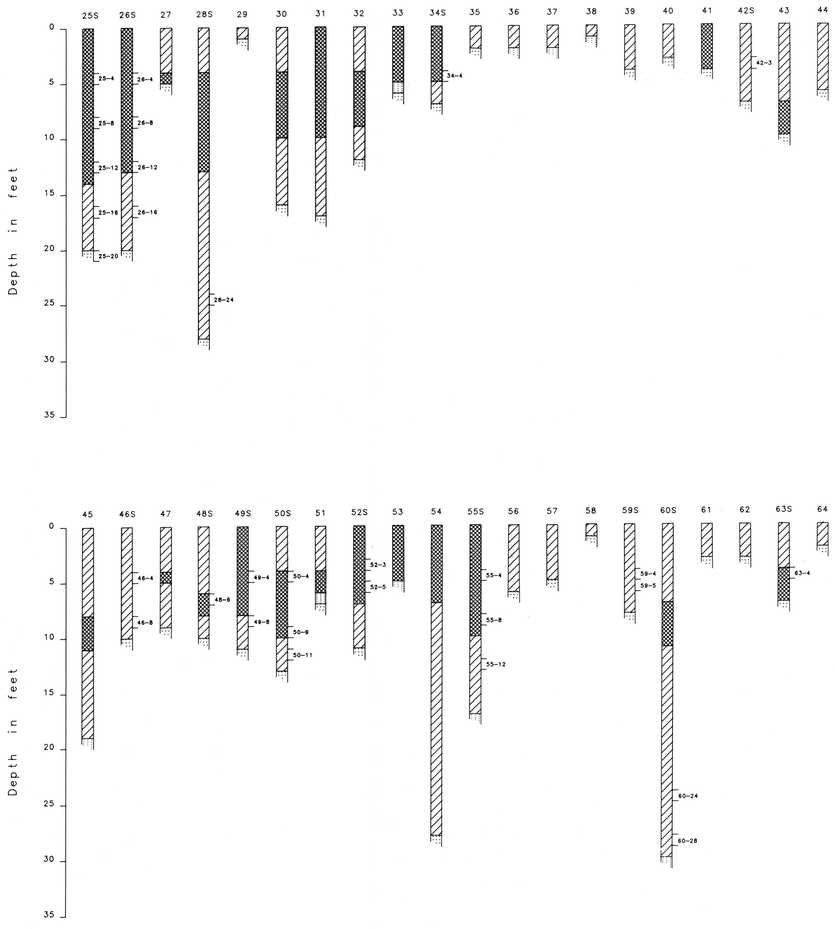


Figure 1.-Stratigraphy of cores taken from wetlands in the Kingston 7.5-minute quadrangle, showing depths of individual samples.



EXPLANATION

WETLANDS ON PEAT, CLAYEY PEAT, AND PEATY CLAY

MAP UNIT	DESCRIPTION
	Clayey peat and peaty clay generally less than 3ft. thick but may reach depths of 10ft..
	Commercial quality peat absent of generally less than 5ft. thick; clayey peat and peaty clay generally less than 10ft. thick, but may reach depths of more than 20ft..
	Commercial quality peat averages between 5ft. and 10ft. thick, generally over clayey peat and peaty clay.
	Commercial quality peat averages more than 10ft. thick, generally over clayey peat and peaty clay.

WETLANDS NOT ON PEATY MATERIAL

	Silt and clay with minor sand.
	Sand with minor silt.

MAP SYMBOLS

● 25S	Location and number of core (Fig. 1). An S denotes that a chemistry sample was taken from this locality. If there is not an S present, then a chemistry sample was not taken from this locality.

Introduction

Wetlands within the study area were visited by the authors during the spring of 1989 as part of an ongoing collaborative effort between the U.S. Geological Survey and the State of New Hampshire to study wetlands and associated peat resources within the State of New Hampshire. The intent of this study was to identify the potential for peat resources, and to provide interpretations of the areal and vertical extent of the various organic and inorganic materials present within these wetlands. Cores were taken and samples were collected in order to further the understanding of relationships between organic and inorganic components within the wetlands to adjacent surficial materials and bedrock.

The wetlands delineated on this map are areas of ground saturated long enough during each year for organic material to accumulate or for chemical changes resulting from wetness to occur in the mineral soil. These organic accumulations and chemical alteration occurrences identify the soil as hydric. In addition, the wetlands support a vegetation cover composed of swamp, marsh or bog heath plants identified as hydrophytic. These soil and vegetation criteria have been accepted by the U.S. Army Corps of Engineers (Federal Manual, 1989) as the basis for delineating wetlands. Wetlands delineated on the National Wetland Maps prepared by the U.S. Fish and Wildlife Service include the hydrologic, hydrophytic plant and hydric soil criteria, and also identify and classify water bodies and areas of ground flooded by man-made construction as wetlands. Such man-made wetlands are not included on this map.

Geologic Setting

The surficial geology within the study area and nearby regions, as described by Koteff and Moore (1994), is made up largely of glacial products of the late Wisconsinan Laurentide ice sheet. These include glaciomarine, glaciolacustrine, and glaciofluvial deposits consisting of poorly to well sorted and stratified clay, silt, sand, and gravel. The most widespread surficial deposit is till consisting of poorly sorted mixtures of clay, silt, sand, pebbles, cobbles, and boulders. There are few bedrock exposures within the study area.

Sampling and analytical methods

Core samples were taken at 40 different sites within the study area to determine the thickness of the various materials comprising the wetlands. A Davis sampler, an instrument that collects a 2cm-diameter by 25cm-long core of sample from specified depths, was used. The core samples were described to construct stratigraphic profiles (figure 1), and 30 samples were taken from 14 of the cores for geochemical and quality analyses (tables 1 and 2). Instrumental neutron activation analysis (INAA) was done on whole dry samples to determine elemental composition (table 1). Moisture was determined as received, pH was determined by dispersal in water, and ash, total sulfur, and Hg were determined on dry samples (table 2).

Peat Resources

Peat is a light- to dark-brown or black residuum formed by the partial decay and disintegration of marsh, fen, swamp, or bog plants. The texture of peat may be (1) **fibrous-matted material composed of mosses, ferns, grasses, rushes, reeds, sedges, and woody material from trees and shrubs, (2) finely-divided plant material so decomposed that their biological identity is lost, or (3) non-fibrous, plastic, colloidal, and macerated material deposited at the bottom of lakes or other bodies of water.**

Commercial quality peat is defined by The American Society for Testing Materials (ASTM) as containing an ash content of not more than 25 percent on a dry basis. Peat should be at least 5 feet thick to be considered as a possible resource.

Because peat is derived from different types of vegetation and may contain different amounts and types of mineral matter, the properties and composition of peat can vary considerably in different deposits and even among different parts of the same deposit. The principal factors that determine the commercial value of peat are water-holding capacity, organic and ash contents, fiber content, sulfur content, and acidity.

The Kingston 7.5' quadrangle contains a total estimated resource potential of 672,800 tons of air-dried peat (table 3). This value is the summation of the estimated tonnages of air-dried peat calculated for each individual wetland containing a minimum peat thickness of 5 feet. If more than one core was taken from a wetland, the peat thickness shown is the average (table 3). Tonnages were estimated by multiplying the peat thickness of a wetland by the size of the wetland, and the resulting volume was multiplied by 200 tons of air-dried peat per acre-foot. It should be noted that these estimates are based upon a minimal number of cores taken, and may be overstated.

Other units described on the map delineating organic materials include clayey peat and peaty clay. Clayey peat refers to a sample which generally contains more peat than inorganic material by weight on a dry basis, whereas peaty clay refers to a sample generally containing more inorganic material than peat by weight on a dry basis. The clayey peat and peaty clay units contain significantly higher levels of ash than the peat units.

Discussion

The stratigraphic development of the organic and inorganic materials below the wetland surface is controlled by a variety of factors making up the overall setting of the wetland. The shape of the basin may influence the thickness of the materials in the wetland, and the type and structure of the adjacent rock materials may influence the ash and elemental content of the organic materials below the wetland surface. Ground and surface water regimes will also influence ash and elemental content.

Wetlands within the Kingston 7.5' quadrangle are within basins in which topography and geomorphology are controlled largely by glacial materials. Overall, the areas containing the thickest peat intervals are located in the south-central part of the quadrangle, where glaciomarine sediments are predominant.

Trace element concentrations generally increase with increasing ash content; however, there appear to be no systematic geochemical anomalies for the elements analyzed (table 1). Only two samples (49-8 and 50-4) contain detectable gold. Cores from which multiple samples were taken show that ash content generally increases with depth (table 2). For all samples, the total sulfur content ranges from 0.02% to 3.4%, and the pH ranges from 2.8 to 6.1 with no systematic relation to ash content.

References

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Federal manual for identifying and delineating jurisdictional wetlands, 1989: Federal Interagency Committee for Wetland Delineation, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and U.S.D.A. Soil Conservation Service, Washington, D.C., Cooperative Technical Publication, 76pp.

Koteff, Carl, and Moore, R.B., 1994, Surficial geologic map of the Kingston quadrangle, Rockingham County, New Hampshire: U.S. Geological Survey Geologic Quadrangle Map GQ-1740. Scale 1:24,000.

Table 1.-Elemental analyses of core samples by instrumental neutron activation analysis, all values are in parts per million except where noted.

SAMPLE NUMBER	Na(%)	K(%)	Sc	Cr	Fe(%)	Co	Ni	Zn	As	Se	Br	Rb	Sr	Sb	Cs	Ba
25-4	0.022	<0.04	0.411	1.56	0.16	1.04	<6	14	2.17	0.83	29.3	<3	59	0.047	0.057	<50
25-8	0.024	<0.05	0.645	3.4	1.108	1.55	14.7	8.4	3.85	0.99	38.2	<5	50	<0.05	0.095	<60
25-12	0.09	0.134	1.38	8.2	2.3	17	46	64.2	41.7	1.4	54	<8	52	<0.1	0.226	<80
25-16	0.327	<0.5	3.17	21.1	4.16	20.1	48	88	86	2.6	60	15.8	76	<0.1	1.16	188
25-20	1.63	1.26	2.44	11.3	1.026	2.4	6.9	16.5	2.9	<0.6	<1	79	143	<0.08	1.98	330
26-4	0.035	0.038	0.504	2.69	0.495	1.07	8.8	9.8	1.4	0.5	18.8	2.6	40	0.044	0.109	<50
26-8	0.028	0.03	1.23	6.4	0.99	3.56	14.7	28.3	13.4	2	56	<3	58	0.072	0.25	170
26-12	0.09	0.119	1.18	9.4	1.92	6.34	28	14.4	39.3	1.14	67	4.4	44	0.097	0.52	140
26-16	0.317	<0.5	5.09	31.7	9.59	36.1	100	178	227	2.5	62	24.5	91	0.157	1.77	167
28-24	0.454	<0.5	5.21	30.6	10.47	24.2	53	112	115	2.2	58	30	51	0.099	1.82	221
34-4	0.08	0.21	0.896	3.55	0.081	1.02	21.1	16.9	3.88	1.23	18.1	<2	53	0.074	0.099	86
42-3	0.023	0.13	0.679	3.4	0.083	0.43	<4	6	0.64	1.36	24.8	3.3	60	0.054	0.102	67
46-4	0.018	<0.1	0.153	1.23	1.8	0.24	<14	8.2	7.02	0.66	26.5	<4	40	<0.04	0.131	58
46-8	0.179	0.43	<3	13	<2	<10	<13	<70	72	0.086	71	14.2	61	0.069	<2	138
48-6	0.079	0.125	1.48	7.9	1.1	3.52	9.5	16.9	49.9	1.95	56	5.3	41	0.061	0.92	<80
49-4	0.038	0.029	0.286	2.89	0.454	0.782	<9	7.2	1.79	0.79	15.4	<3	71	0.069	<0.06	<40
49-8	0.645	0.79	4.08	26.2	1.27	10.24	19	42.3	15.9	<1	43.8	29	100	0.076	1.47	199
50-4	0.021	0.024	0.321	1.55	0.141	0.436	5.1	13.2	1.72	1.07	29.3	<2	63	0.046	0.038	75
50-9	0.019	<0.03	0.152	1.03	0.677	0.26	<5	7	1	0.58	18.9	<3	42	<0.03	0.051	<40
50-11	0.155	0.33	1.86	11.9	0.815	5.22	23	38.8	12.9	1.25	66	9.1	61	<0.09	0.85	99
52-3	0.015	<0.03	0.326	2.13	0.155	0.91	<4	3.3	3.68	0.89	19.7	<2	38	0.051	<0.08	58
52-5	0.287	<0.4	2.18	15.3	0.313	2.72	10	23.5	10.7	1.02	37.1	17.2	<70	0.059	1.06	131
55-4	0.023	<0.04	0.586	3.08	0.22	0.544	<5	4.6	1.8	1.05	71	<3	45	<0.1	0.118	<80
55-8	0.033	0.054	0.756	2.9	0.22	0.719	6.3	4.9	1.94	1.46	41.6	<2	71	0.08	0.272	62
55-12	0.148	<0.5	1.76	11.5	0.668	4.65	10	42	3.3	0.72	66	13.4	43	0.069	0.68	93
59-4	0.053	<0.4	3.1	6.9	0.64	0.86	<11	9.9	2.61	2.76	36.2	4	92	0.097	0.65	247
59-5	0.371	<0.8	5.03	27	1.7	30.2	38	102	33	2.1	43.9	17.4	73	0.16	1.47	206
60-24	0.128	<0.6	2.03	13.7	2.69	12.55	17	56	70.7	1.17	61	9	<70	<0.1	0.95	129
60-28	0.94	1.6	8.9	51.3	11.6	45.9	71	187	33.5	<2	10.8	66	149	0.11	4.31	365
63-4	<0.9	<1	3.12	21.1	0.78	6.97	17	42	11.8	<0.8	830	26.5	95	0.36	1.03	<400

TABLE 1-(CONT.)

SAMPLE NUMBER	La	Ce	Nd	Sm	Eu	Tb	Yb	Lu	Hf	Ta	W	Au(PPB)	Th	U
25-4	3.06	3.21	<12	0.49	0.085	0.044	<0.2	0.036	0.086	0.062	<0.3	<3	0.321	1.02
25-8	10.2	11.5	<15	1.66	0.256	1.149	0.4	0.065	0.203	<0.04	0.53	<4	0.651	2.46
25-12	18.2	23.7	<15	3.36	0.509	0.315	0.87	0.162	0.445	0.078	1.5	<5	1.94	5.1
25-16	27	39.1	<20	4.92	0.779	0.497	1.41	0.214	1.99	0.47	<1	<4	4.81	7.6
25-20	12.3	20.9	<10	2.32	0.638	0.287	1.16	0.154	2.47	0.587	<1	<5	3.34	1.39
26-4	5.68	7.43	<7	1.038	0.142	0.092	0.29	<0.08	0.172	0.032	0.1	<2	0.779	4.8
26-8	17.1	21.1	<14	3.39	0.525	0.312	1.06	<0.06	0.297	0.059	0.46	<4	1.46	10.4
26-12	9.66	12	<20	1.62	0.241	0.164	0.78	<0.03	0.614	0.122	0.71	<3	1.78	4.6
26-16	51.8	71.5	<31	8.68	1.33	0.856	2.38	0.327	1.98	0.516	<3	<7	7.56	17.7
28-24	42.4	62.2	<27	7.95	1.24	0.84	2.63	0.371	2.95	0.547	2.7	<4	8.09	10.08
34-4	11.9	11	<6	2.32	0.325	0.207	0.58	<0.04	0.326	0.031	0.36	<2	0.862	5.4
42-3	4.81	5.53	<2	0.677	0.113	0.075	0.235	0.038	0.269	0.064	<0.3	<1	0.78	1.94
46-4	0.84	1.22	<2	0.115	0.025	<0.01	0.096	0.01	0.076	<0.04	<0.3	<1	0.153	0.15
46-8	14.8	<31	<12	2.8	<0.6	<0.4	1.04	0.14	<2	0.244	5.7	<3	<4	1.95
48-6	14.1	18.2	<16	2.79	0.429	0.256	0.85	0.095	0.65	0.11	0.61	<3	2.11	5.3
49-4	3.28	4.17	<7	0.595	0.098	0.057	0.21	<0.03	0.386	0.049	<0.2	<2	0.316	1.6
49-8	32.7	48.4	<20	5.92	0.88	0.548	1.84	0.298	3.7	0.63	<3	5.6	6.08	7.8
50-4	2.03	2.36	<7	0.321	0.053	0.032	0.15	<0.02	0.116	0.04	<0.2	2.7	0.363	0.87
50-9	0.83	1.11	<8	0.111	<0.05	0.018	<0.1	<0.01	0.081	<0.03	<0.2	<2	0.139	0.14
50-11	14.7	20.5	<15	2.55	0.42	0.254	0.88	0.122	0.97	0.222	1.2	<3	2.96	4.75
52-3	2.35	3.1	<7	0.379	0.066	0.042	0.12	<0.02	0.105	0.039	<0.2	<3	0.427	0.77
52-5	13	18.7	<10	2.22	0.391	0.239	0.99	0.163	1.81	0.275	<0.6	<2	2.49	3.92
55-4	5.49	4.5	<12	0.78	0.131	0.075	<0.2	<0.03	0.152	0.043	0.44	<3	0.62	1.61
55-8	9.54	7.54	<18	1.83	0.28	0.167	0.45	0.065	0.282	0.036	<0.2	<2	0.939	4.8
55-12	17.4	21.7	<10	2.86	0.44	0.268	0.74	0.139	0.97	0.195	1.9	<3	2.44	3.72
59-4	65.6	59	<40	11.7	1.59	0.94	2.47	0.323	0.35	0.089	<3	<2	3.56	43.5
59-5	71.2	106	<40	12.8	1.75	1.14	3.4	0.425	2.62	0.46	<1	<8	7.2	25
60-24	22.8	32.6	<12	4.08	0.599	0.371	1.15	0.235	0.75	0.203	1.9	<3	2.78	7.7
60-28	82	112	<40	14.5	2.11	1.38	4.22	0.72	5.84	1.03	3.6	<4	12.6	21.6
63-4	14.5	22.1	<90	2.62	0.435	0.291	<1	<0.1	2.01	0.515	<3	<22	3.7	8.5

Table 2.-Moisture, pH, ash, sulfur, and Hg content of core samples; d.b. refers to analyses done on a dry basis.

SAMPLE NUMBER	moisture (as received%)	pH	ash% (d.b.)	total sulfur%	Hg-ppm
25-4	94.2	4.7	3.7	0.62	0.04
25-8	91.3	5	8	0.72	0.04
25-12	91.2	3.2	20.2	3	0.04
25-16	87.5	2.8	5.7	2.7	<0.005
25-20	29.6	3.3	98.8	0.02	<0.005
26-4	90.8	4	8.3	0.32	0.04
26-8	91.3	4.6	10.4	1.7	0.05
26-12	93.1	2.9	15.8	2.9	0.04
26-16	88.4	3.4	48	3.1	0.01
28-24	86.7	4.6	60.6	1.2	<0.005
34-4	90.1	5	6.3	1.2	0.02
42-3	86.6	4.3	4.5	0.57	<0.005
46-4	61.5	3.7	7.1	0.08	<0.005
46-8	89.7	6.1	41.3	0.88	<0.005
48-6	91.2	4.2	10.2	0.77	0.02
49-4	89.3	4.7	5.3	0.53	0.02
49-8	87.4	4.1	56.1	0.63	<0.005
50-4	88	4.8	4.6	0.34	0.02
50-9	89.6	4.9	3.1	0.14	<0.005
50-11	91.2	4.3	30.2	1.2	<0.005
52-3	87.6	3.7	2.5	0.73	0.02
52-5	90.1	3.4	16.6	1.1	0.01
55-4	95.2	5	20.3	0.56	<0.005
55-8	90.8	5.2	8.5	0.88	0.02
55-12	86.4	4.8	62	0.37	<0.005
59-4	88.6	4.7	9.3	1	0.05
59-5	85.4	3	61	1.3	0.01
60-24	86.9	-	50.3	1.3	0.01
60-28	73.7	-	83.4	0.37	<0.005
63-4	89.4	5.5	44.8	3.4	<0.005

Table 3.-Peat resources estimated on the basis of a minimum thickness of 5 feet, and assuming a 1-acre-foot yield of 200 tons air-dried peat.

Wetland as designated by core number(s)	Acres	Peat thickness in core (ft.)	Air-dried weight (short tons)
25,31	42	12	100,800
26,28	94	11	207,000
30,33	28	6	30,900
32	26	5	26,100
34	17	5	17,300
49	59	8	95,200
50	32	6	38,400
52	20	7	28,500
53,54	74	6	92,700
55	18	10	35,900
			672,800 total

WETLAND AND PEAT RESOURCE MAP OF THE KINGSTON 7.5-MINUTE QUADRANGLE, NEW HAMPSHIRE

By

John C. Jackson and Cornelia C. Cameron

1995

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