Physical Peat Characteristics and Alder Allometrics of Peatland Communities

BIOS 569 — Practicum in Aquatic Biology

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Abstract

This paper will address two studies involving wetland ecology: (1) a comparison of peat characteristics among and between differing peatlands and (2) alder allometrics. Peat from two differing peatlands was extracted and studied according to percent moisture, dry / wet weight ratio, bulk density, percent rubbed fiber, and percent organic content. We then compared the trends at each nest to one another at each nest, within each site, across each peatland type, and between each peatland type. We have found that differences in these characteristic trends correspond to what is expected for each observed peatland type; namely, differences in organic quality, which affects all other peat characteristics studied, vary according to peatland type as would be expected and expressed by plant matter and soil terms.

The alder allometrics study was undertaken in order to develop a consistent relationship between physical dimensions of the alder bush and its biomass. Resulting from our study, we found relationships between standard measurements of basal diameter and maximum height with biomass to be strongest and highly correlated to each other relative to the relationship between canopy area and biomass. These relationships will enable biomass to be estimated with fairly high accuracy in a non-destructive manner during future research projects.

Introduction

Finding relationships between physical characteristics present in differing wetlands to support the expected existing mechanics that lie behind these characteristics will aid in the continuing study of defining individual peatland communities along such gradients and mechanics consistently. In this study, we will (1) determine the physical characteristics of peat in differing peatlands and (2) attempt to find a relationship between various dimensions of the speckled alder (Alnus rugosa) in differing wetlands in order to develop a method of determining biomass of alder individuals in the field in a non-destructive manner. Each of these areas of study will be used for further study in determining consistent relationships between physical characteristics in peatlands and the underlying mechanics of the wetland types.

Our study is attempting to further define reasons for differences in peatland types. I believe the study of physical peat characteristics will yield results showing that as decay of the organic material increases, the physical characteristics of the peatland will be like that of fens, since these are generally minerotrophic (Sigel 1992). There is no hypothesis for results of the alder allometrics study, aside from the belief that a fairly consistent relationship will be found between physical dimensions of the alder bush and its structural biomass.

Materials and Methods

Peat Characteristics

Studies were conducted at the University of Notre Dame Environmental Research Center (UNDERC) property located on the border of Northern Wisconsin and the Michigan Upper Peninsula from May through July 1997. Peat was collected from two sites on the UNDERC property: (1) the cedar swamp on the northeast back of Brown Creek on the upstream side of the road (about 75 meters directly in from the road) and (II) the bog along the southwest bank of the Ontonagon River (about 200 meters along the river from the mouth of the river at Tenderfoot Lake). Please refer to figures 1a and 1b for maps to these sites. Each site was arranged with five nests in a row perpendicular from the creek/river and labeled from A to E. Please see figures 1c and 1d for an illustration of the arrangement of the nests at each site. At site I, the nests were arranged so that nests A and B were located in the alder bushes while nests C, D, and E were located in the cedar swamp. Orange marker tape was left at each nest so that interested parties may revisit the same nests for further research.

I collected one entire peat core to the mineral surface contact at each nest using a Russian Corer to extract the peat cores. These cores, taken in 50 cm increments, were cut with a serrated bread knife in 5 cm increments for the top 20 cm and in 10 cm increments thereafter; these samples were each immediately placed in labeled quart size Ziploc® freezer bags. Upon return from the field, samples were refrigerated in the laboratory until further analyses were carried out.

The first analysis conducted was bulk density. I sorted through all sample, removing all roots, undecomposed wood, and stones and mixed the samples into one composite sample. I the weighted these sample in their plastic bags and used a median weight of the bags as the tared weight. I found the density of each sample by measuring the corer; some samples near the surface (0-20 cm) would sometimes be of less volume than the volume indicated by the corer (the corer being 1/3 or less empty of peat horizontally), but unfortunately I did not take this into account in the field or the laboratory. Bulk density is calculated as:

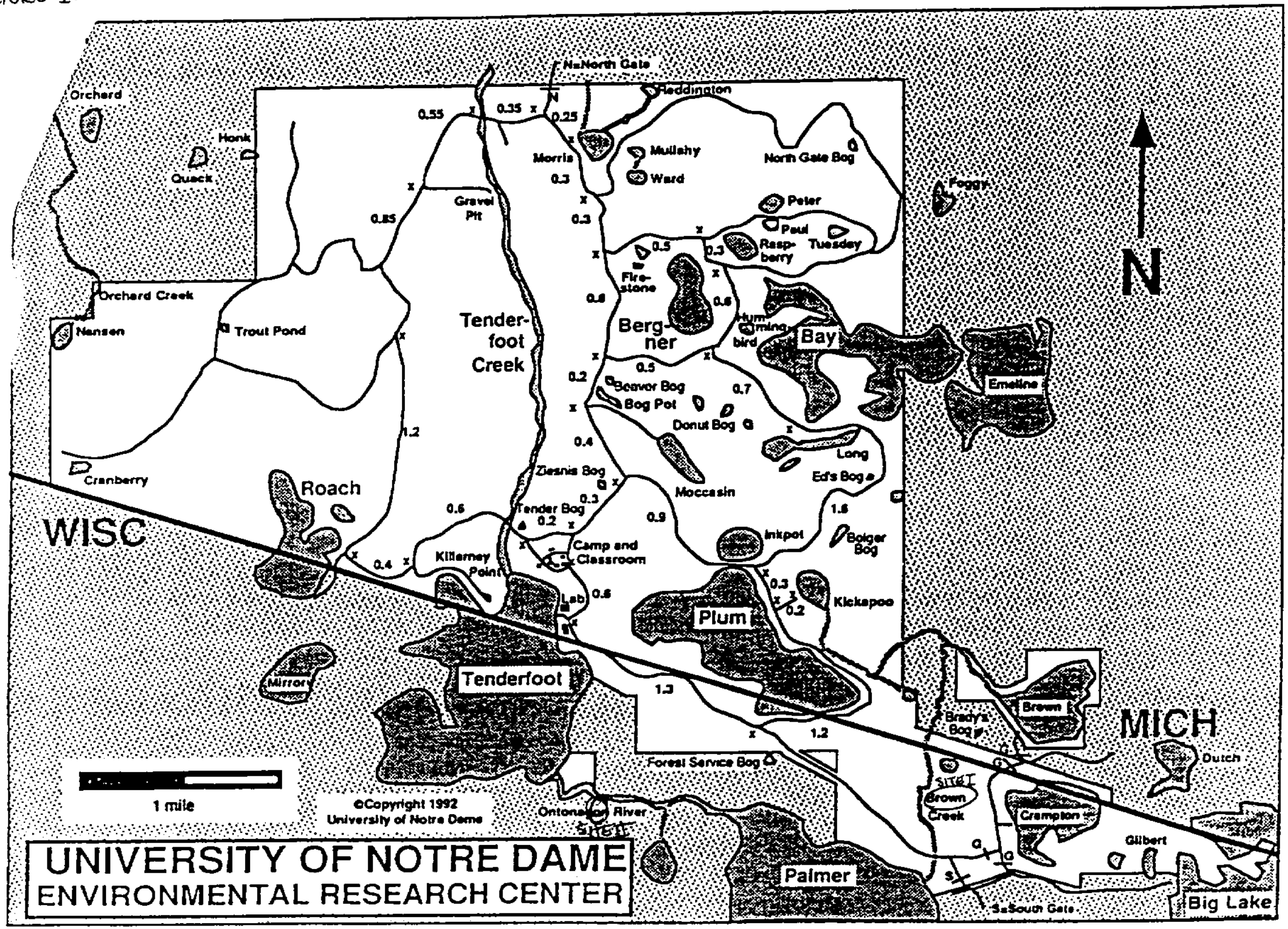
Bulk density = (wet weight of increment * dry/wet weight ratio‡)/volume

‡This is calculated below

I then determined the percent moisture of one subsample of each sample. I first obtained each subsamples' wet weight, then dried the subsamples in a laboratory drying oven at 60-70 degrees Celsius in aluminum weigh boats until I obtained a constant dry weight; this process usually took at least 24 hours. Percent moisture is calculated as:

% moisture = (wet weight - dry weight) * 100

FIGURE 1a


UNIVERSITY OF NOTRE DAME
ENVIRONMENTAL RESEARCH CENTER
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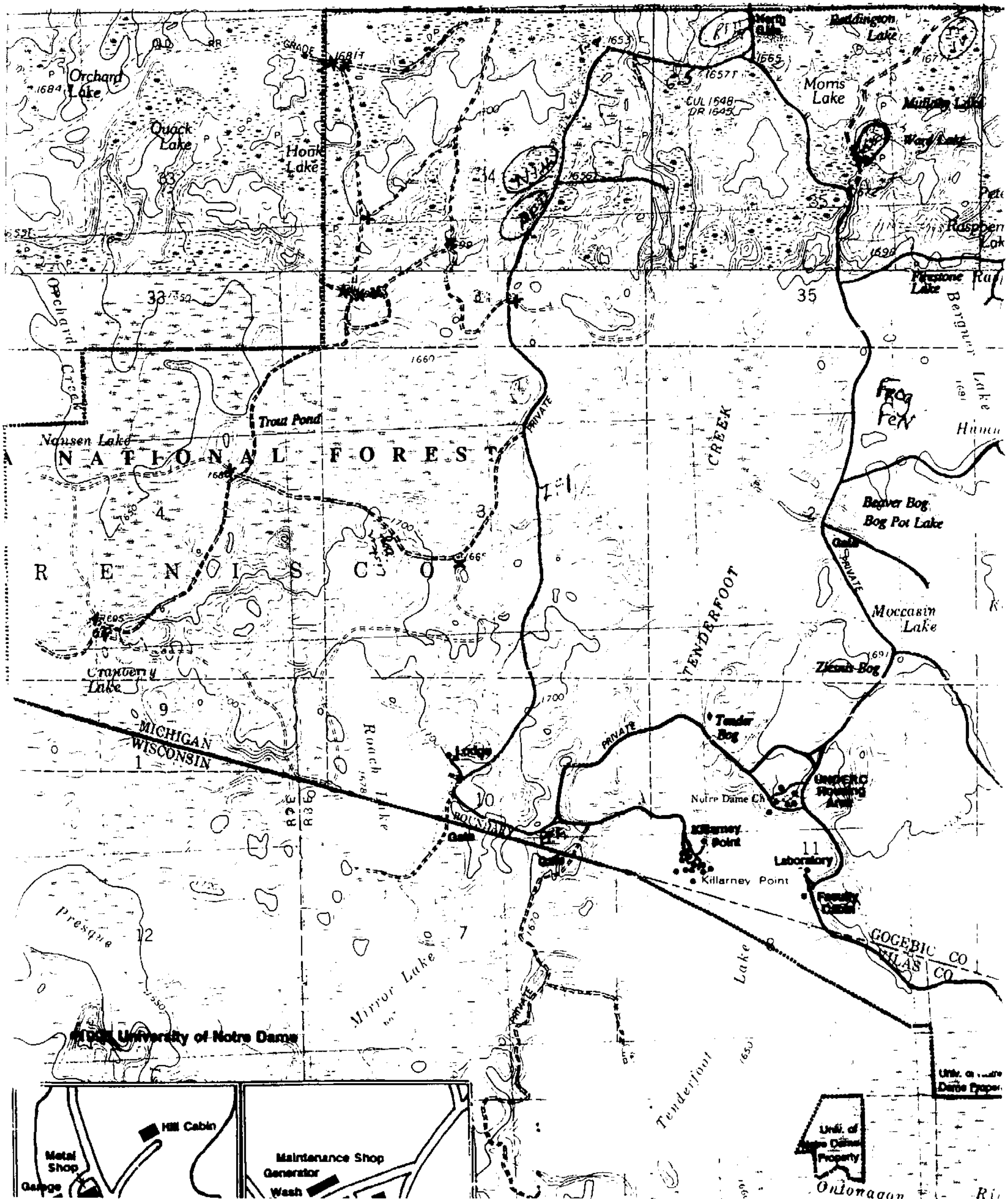
University of Notre Dame
1 mile
N
WISC
MICH
Orchard
Honk
Quack
Orchard Creek
Nansen
Trout Pond
Cranberry
Roach
Mirror
Tenderfoot
Tender-
foot
Creek
Gravel
Pit
Killarney
Point
Tender Bog
Ziesnis Bog
Camp and
Classroom
Lab
N=North Gate
Heddington
Morris
Mullahy
Ward
North Gate Bog
Peter
Paul
Tuesday
Rasp-
berry
Fire-
stone
Berg-
ner
Hum-
ming
bird
Bay
Emeline
Foggy
Beaver Bog
Bog Pot
Donut Bog
Long
Ed's Bog
Moccasin
Inkpot
Bolger
Bog
Kickapoo
Plum
Forest Service Bog
Ontonagon River
Palmer
Brady's
Bog
Brown
Brown
Creek
Crampton
Gilbert
Dutch
Big Lake
S=South Gate
0.55
0.35
0.25
0.85
0.3
0.3
0.5
0.3
0.6
0.8
0.5
0.2
0.7
0.4
1.2
0.6
0.2
0.3
0.9
1.6
0.4
0.6
0.3
0.2
1.3
1.2

FIGURE 1b



Orchard Lake
Quack Lake
Hook Lake
Moms Lake
Ward Lake
North Gate
Raspberry Lake
Firestone Lake
Trout Pond
Nausen Lake
NATIONAL FOREST
RENOIS CO
Orchard Creek
Cranberry Lake
MICHIGAN
WISCONSIN
Roach Lake
Lodge
BOUNDARY
Gate
PRIVATE
TENDERFOOT
CREEK
Frog Fen
Beaver Bog
Bog Pot Lake
Moccasin Lake
Tender Bog
Notre Dame Ch
Killarney Point
Laboratory
GOGEBIC CO
VILAS CO
Presque
Mirror Lake
Tenderfoot Lake
University of Notre Dame
Hill Cabin
Metal Shop
Garage
Maintenance Shop
Generator
Wash
Ontonagon

Nest Locations

Figure 1c

Nest	Distance from Stream (m)
IA	3
IB	30.5
IC	41.5
ID	61.5
IE	74.5
IIA	1
IIB	10
IIC	21
IID	46
IIE	78

Figure 1d

From the data obtained in this process, the dry/wet weight ratio was obtained using the relation:

dry/wet weight ratio = dry weight of subsample / wet weight of subsample

When each subsample was completely dried, each was ashed using a muffle furnace for a duration of approximately eight hours. Groups of eight subsamples, each in a crucible with no lid, were placed in the small muffle furnace and the temperature was raised slowly to the 20 marking, and then finally tot he 60 marking, at which the remainder of the time was spent on each sample burning at that temperature. Exact temperatures were not known, as the temperature gauge was broken on the furnace and no thermometer available could withstand the heat. This study allowed me to find percent organic content:

% organic content = ((dry weight - ash weight) / dry weight) * 100

Rubbed fiber content was lastly determined with the following methods. I placed about 10 g of a wet subsample into an osterizer, added 200 ml of tap water, and then added about 2 g Calgon® water softener (weight approximated and not recorded). This mix was then shaken briefly to dissolve the Calgon®, and then it was capped and let to stand overnight. After sitting at least 24 hours, each mixture was then shaken by hand for about 1 minute and then poured through a 100-mesh sieve and washed under a gentle stream of tap water. The remaining residue was collected, weighed, and dried in order to determine rubbed fiber content by:

% rubbed fiber = dry mass of residue on screen / (wet weight of sample * dry/wet weight ratio)

Alder Allometrics

In order to determine the relationship between various dimensions of the speckled alder bush and biomass, I measured basal stem diameter, maximum height, and maximum canopy area of 15 individuals per site in two wetlands, RFI and NIH. Please refer to figure 2 for maps of the location of these areas. I collected each sample, measured their physical dimensions, air dried them for six weeks, weighed them, and then oven-dried a subsample of the air-dried material at 60 degrees Celsius, and finally reweighed the subsample. The maximum canopy area was found by measuring two perpendicular horizontal diameters at each samples' maximum canopy area (approximated) and using the following equation to find the area of the ellipse:

Area (ellipse) = radius 1 * radius 2 * π

The following equation was used to determine total dry weight (biomass) of the samples:

Total dry weight = total wet weight * (subsample dry weight / subsample wet weight)

I will use Excel and statistical computer programs to find a relationship between the physical measurements and biomass.

Results

Peat Characteristics

From the analyses outlined above, the percent moisture, dry/wet weight ratio, bulk density, percent rubbed fiber, and percent organic content were found for the peat samples of sites I and II. This data is presented in tables 1a -1e for site I and in tables 2a-2e for site II. Each variable was plotted against depth to visualize the trends stemming from the peat conditions. These figures are revealed in graphs 1a-1e for site I and graphs 2a-2e for site II.

Site I

Two groupings emerge from the trends seen in graph 1a depicting the percent moisture (%M) for site I: nests IB and IE move in similar fashion and retain a %M that is similar to each other, while nests IA, IC, and ID possess a %M on the higher end of the scale. More specifically, nest IB increases at shallow depths, decreases at intermediate depths, and begins to increase again as depth increases from 30 cm. Nest IE decreases at shallow depths, remains rather constant at intermediate depths, and increases overall as depths continue to increase. Nest IA increases overall as depth increases, with a decrease in %M at the two maximum depths. Nest IC remains rather constant mostly between 600 and 850 %M with much fluctuation. Nest ID remains rather constant at shallow depths, increases at intermediate depths, and begins a sharp decline as depths continue to increase. Thus we see the two trends emerging: nests IA, IC, and ID are focused mainly above 600 % M while nests IB and IE move in similar fashion and remain below 600 %M after 15 cm depth.

Again, similar groupings emerge when considering graph 1b, the dry/wet weight ratio (D/W) for site I. Nests IB and IE move similarly, increasing at shallow depths, remaining constant for a short interval at intermediate depths, and then decreasing for the most part as depth increases. These two nests retain a D/W mostly above .15 while nests IA, IC, and ID possess a D/W below .15 for the most part. More specifically, nest IA decreases overall, nest IC remains rather constant as depth increases with some fluctuation, while nest ID increases overall. Although these three nests do not move in a similar fashion, they still remain in the lower spectrum of D/W.

When viewing the plotted graph of bulk density (BULK) against depth (graph 1c) we see again that nests IB and IE move in similar fashion at the higher end of the spectrum (mostly above .15) while nests IA, IC, and ID again group

Table 1a

% Moisture: Site I

%M IA	%M I B	%M IC	%M ID	%M IE	Depth
574.28571	669.57	714.63	843.48	736.84	0.00
451.11111	600.00	766.67	845.45	745.24	5.00
545.90164	804.17	930.30	816.67	442.03	10.00
600	373.77	856.52	972.73	303.80	15.00
722.64151	328.83	581.82	1004.55	330.97	20.00
830.43478	342.57	913.33	726.19	280.13	30.00
868.88889	544.87	690.16	637.88	315.09	40.00
781.08108	461.00	840.98		264.65	50.00
1247.5	549.38	721.43		290.96	60.00
1107.4074	603.75	614.67		403.64	70.00
886.66667	691.67	662.50		582.89	80.00
	759.18			408.79	90.00

Table 1b

Dry/Wet Ratio: Site I

D/W IA	D/W IB	D/W IC	D/W ID	D/W IE	Depth
0.15	0.13	0.12	0.11	0.12	0.00
0.18	0.14	0.12	0.11	0.12	5.00
0.15	0.11	0.10	0.11	0.18	10.00
0.14	0.21	0.10	0.09	0.25	15.00
0.12	0.23	0.15	0.09	0.23	20.00
0.11	0.23	0.10	0.12	0.26	30.00
0.10	0.16	0.13	0.14	0.24	40.00
0.11	0.18	0.11		0.27	50.00
0.07	0.15	0.12		0.26	60.00
0.08	0.14	0.14		0.20	70.00
0.10	0.13	0.13		0.15	80.00
	0.12			0.20	90.00

Table 1c

Bulk Density: Site I

Bulk IA	Bulk IB	Bulk IC	Bulk ID	Bulk IE	Depth
0.1586487	0.0875256	0.0810023	0.1144295	0.1009254	0.00
0.1708188	0.1324841	0.0957619	0.0639331	0.1486032	5.00
0.1793277	0.1059145	0.0977389	0.109612	0.2235056	10.00
0.1753867	0.2460274	0.117031	0.1007314	0.3431594	15.00
0.1523947	0.2893008	0.1828896	0.0895402	0.3043399	20.00
0.1361085	0.2931603	0.1221139	0.1399447	0.3384673	30.00
0.1094727	0.1786263	0.1506178	0.1557443	0.3212377	40.00
0.1320938	0.2209147	0.1274415		0.347121	50.00
0.0851305	0.2116415	0.1477735		0.370471	60.00
0.1015889	0.1744069	0.2022902		0.2660903	70.00
0.0932658	0.1540329	0.0375065		0.1732275	80.00
	0.1193178			0.2363226	90.00

Table 1d

Percent Rubbed Fiber: Site I

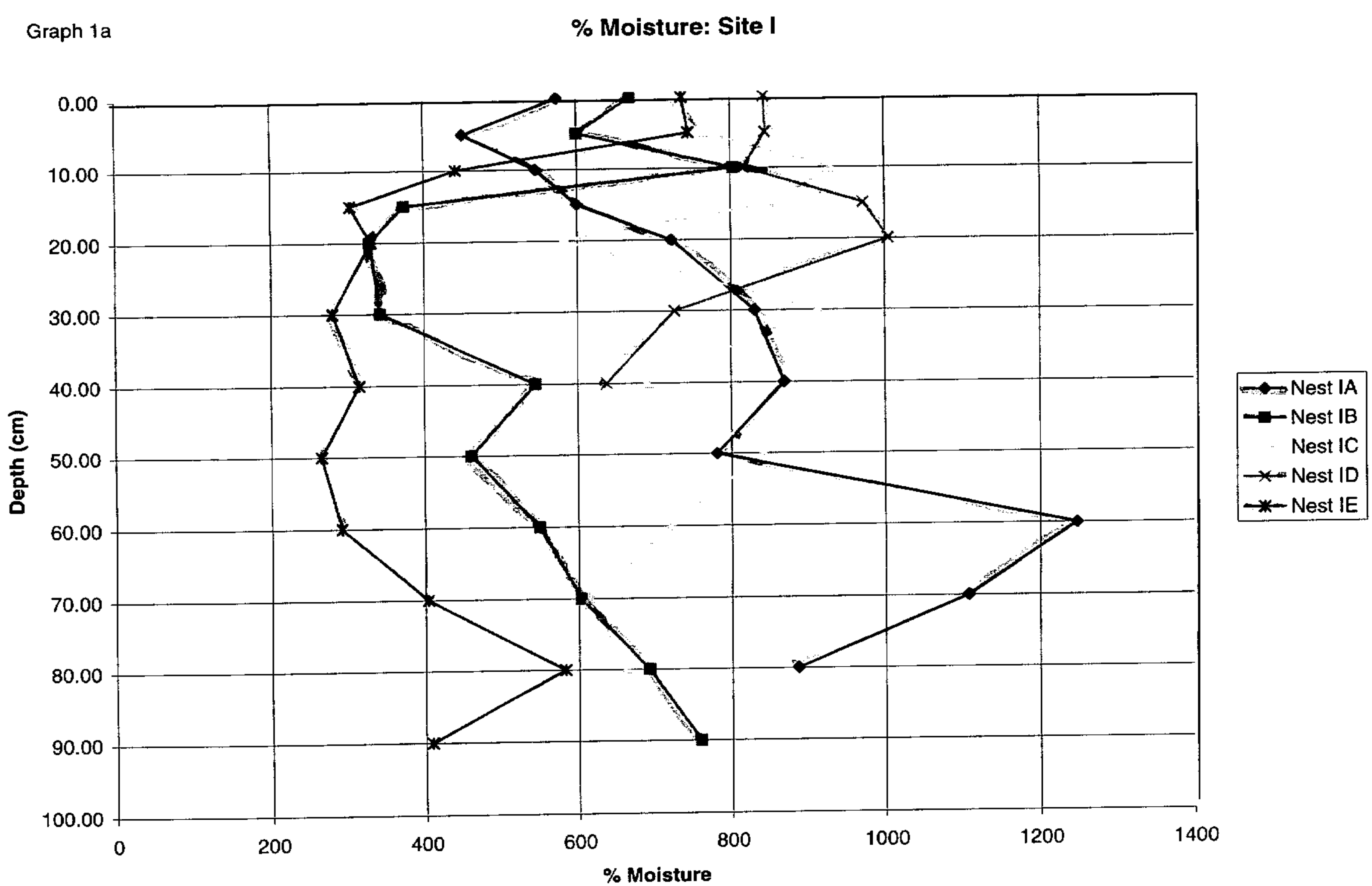
%RF IA	%RF IB	%RF IC	%RF ID	%RF IE	Depth
26.916216	43.122189	57.10597	60.747091	60.544573	0.00
28.74401	37.927757	34.087185	61.870236	32.41326	5.00
28.196721	48.052242	44.615338	65.47619	21.168655	10.00
31.15727	31.410198	45.959002	55.959198	16.808607	15.00
29.171685	22.754183	37.485854	50.65712	17.97506	20.00
33.390967	34.814101	30.6143	39.650669	33.137799	30.00
29.826768	37.166524	38.99097	34.167786	25.710139	40.00
40.798828	39.20374	27.508593		16.985514	50.00
54.066358	30.357322	36.11598		34.404819	60.00
41.29965	56.868687	24.016293		31.477273	70.00
52.982101	41.095331	33.416335		47.99461	80.00
	52.673572			33.818463	90.00

Table 1e

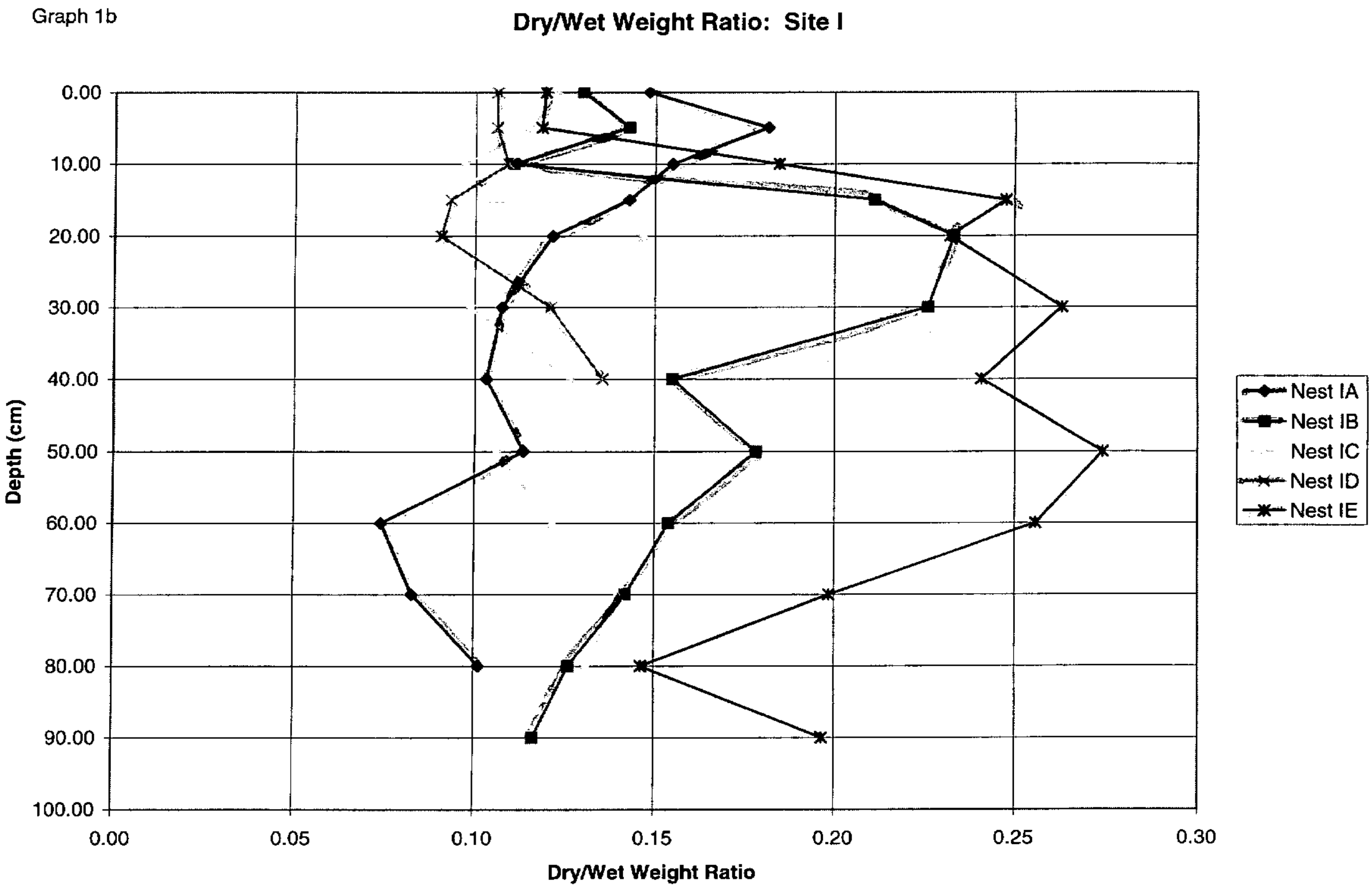
Percent Organic Content: Site I

% OC IA	% OC IB	%OC IC	% OC ID	% OC IE	Depth
70.518732	83.486239	80.905459	100	53.333333	0.00
75.630034	84.848485	84.460338		73.809524	5.00
69.772097	75.745202	89.037037	96.551724	32.352941	10.00
75.221687	46.566629	88.466208	93.75	25.974026	15.00
76.998192	46.269592	84.147157	63.636364	15.789474	20.00
85.663308	48.424237	86.759021	61.904762	23.333333	30.00
79.042977	81.307937	86.462722	87.5	54.807692	40.00
81.893114	63.455455	87.579434		31.794872	50.00
85.267212	83.256624	88.211858		27.388535	60.00
73.256867	85.846346	86.601307		71.818182	70.00
79.750164	87.206355	87.505442		84.415584	80.00
	88.401846			60	90.00

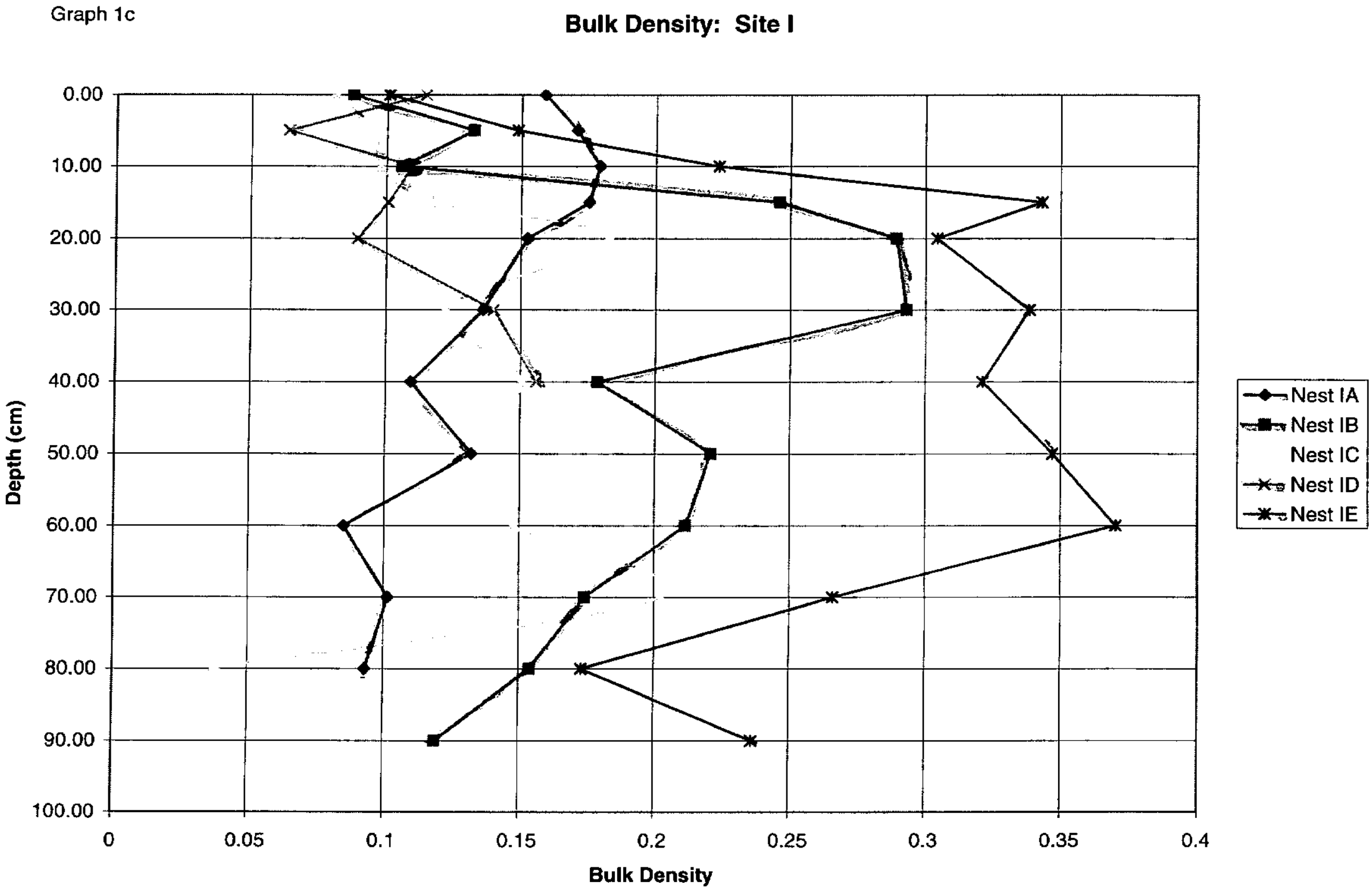
Graph 1a


% Moisture: Site I
Depth (cm)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
0
200
400
600
800
1000
1200
1400
% Moisture
Nest IA
Nest IB
Nest IC
Nest ID
Nest IE

Graph 1b

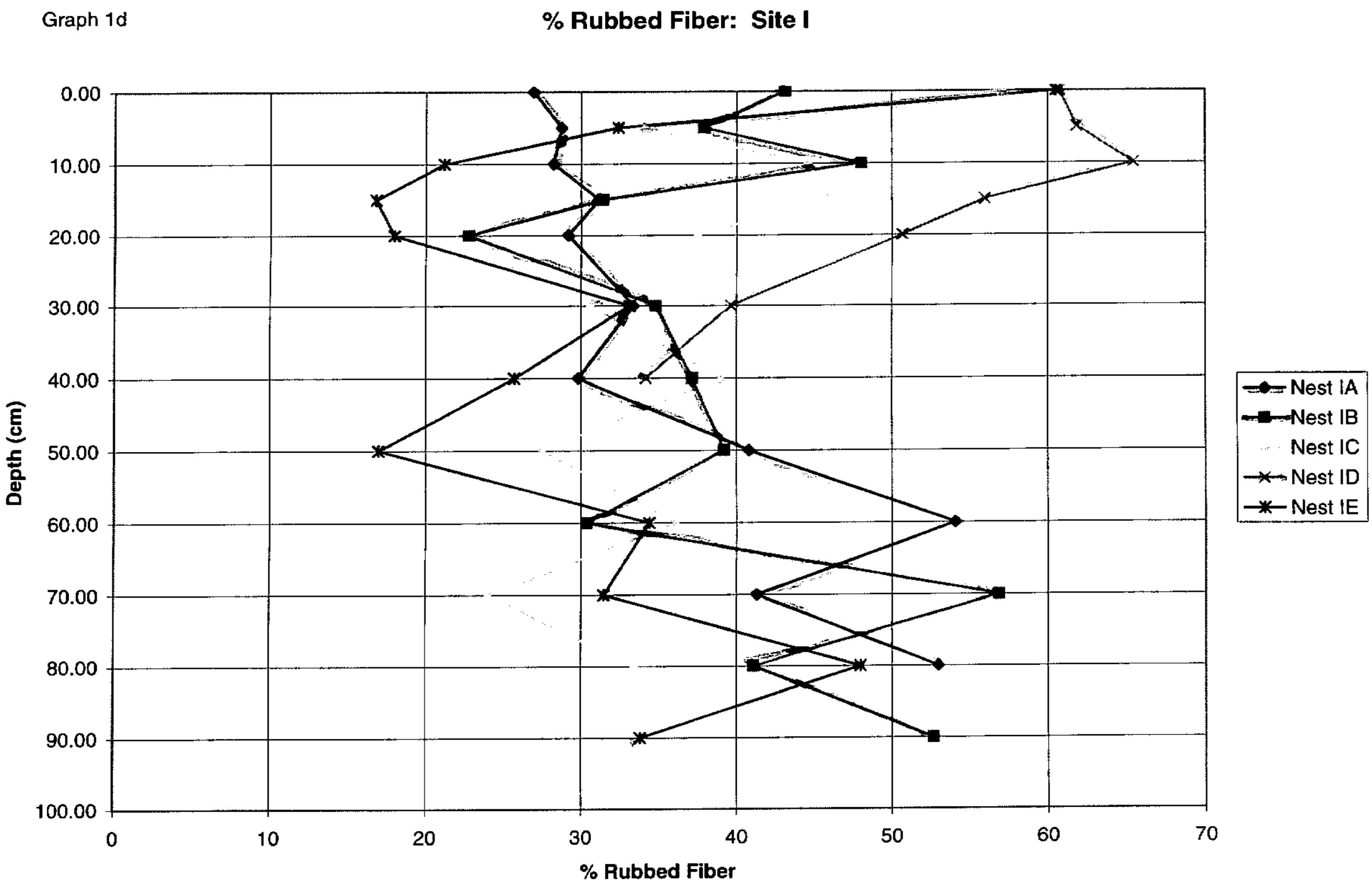

Dry/Wet Weight Ratio: Site I
Depth (cm)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
0.00
0.05
0.10
0.15
0.20
0.25
0.30
Dry/Wet Weight Ratio
Nest IA
Nest IB
Nest IC
Nest ID
Nest IE

Graph 1c



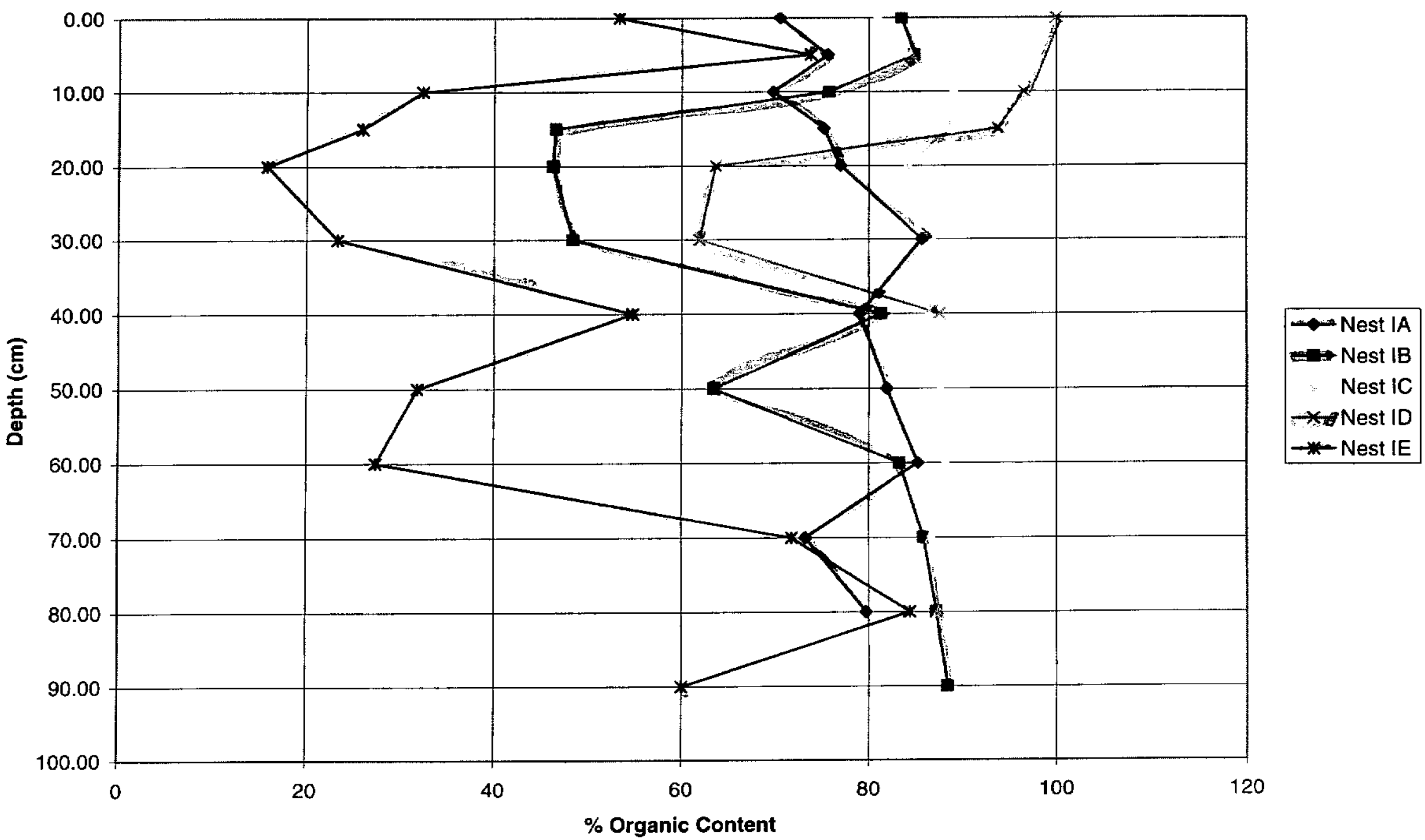
Bulk Density: Site I
Depth (cm)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Bulk Density
Nest IA
Nest IB
Nest IC
Nest ID
Nest IE

Graph 1d


% Rubbed Fiber: Site I
Depth (cm)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
0
10
20
30
40
50
60
70
% Rubbed Fiber
Nest IA
Nest IB
Nest IC
Nest ID
Nest IE

Graph 1e

% Organic Content: Site I



together at the lower end of the spectrum (mostly below .15). Both IB and IE increase at shallow depths, remain rather constant for a short interval at intermediate depths, and then decrease as depth increases. Nest IA again decreases overall, nest IC remains rather constant with larger fluctuations than those seen with D/W, and nest ID increases overall.

Such strong groupings as seen in the three aforementioned graphs do not emerge readily in the graph of percent rubbed fiber (%RF) (graph 1d). Nests IB and IE still move similarly, decreasing at shallow depths and then beginning a gradual overall increase as depth increases past 20 cm. Nest IA increases overall, nest IC decreases overall, and nest ID decreases overall. There are no strong groupings of nests IB and IE together at one end of the spectrum and nests IA, IC, and ID at another end of the spectrum. Rather, the nests' trends are overlapping mostly between 24 through 56 %RF.

Strong grouping tendencies emerge once again on the plot of percent organic carbon (%OC) against depth (graph 1e). Nests IB and IE decrease at very shallow depths, remains rather constant between 15-30 cm, sharply increases at 40 cm, sharply decreases at 50 cm, and then begins a general increase as depth continues to increase. This time, it is not only nests IB and IE displaying similar movements; instead, nest ID displays equivalent movements, yet at a higher range. Thus, we see that nest IE is highest on the spectrum displaying these movements, nest IB is lower on the spectrum, and nest IE is lowest on the %OC spectrum displaying these trends. All three nests, however, remain lower for the most part on the %OC spectrum than nests IA and IC (note: there is no point for the %OC for nest ID at 5 cm depth because there was an error in the analysis). Nests IA and IC move similarly by remaining rather constant at the higher end of the %OC spectrum. Thus, the two groupings emerging from this graph are that of IB, ID, and IE and the other group of IA and IE.

Thus far, we have not been giving too much weight to the peat conditions at the shallow depths when assessing grouping tendencies along the spectrums. This is because the trends do not emerge and solidify until after 10-20 cm depth, at which point the peat starts to become more compacted and retaining characteristics inherent to particular depths.

Site II

When viewing the plot of these peat conditions against depth for site II, we again see several trends emerging. It is important to note that nests IIA and IIB are measured only to very shallow depths, as indicated by table 2. Looking at graph 2a depicting the %M, we see that there is great fluctuation of %M in all nests, yet overall there are two groupings emerging. Nest IIA and IIB move similarly in that they show an increase in %M at larger depths, maintaining a position at the lower end of the spectrum of %M; however, nests IIC, IID, and IIE show an overall decreasing %M trend as depths increase while these three nests

Table 2a

% Moisture: Site II

% M IIA	% M IIB	% M IIC	% M IID	% M IIE	Depth
611.11111	824.2424	1110	827.27273	1566.6667	0
687.09677	1004.348	1026.316	832.14286	2680	5
725	1193.548	1157.895	802.43902	638.88889	10
667.27273	814.5455	882.6087	782.8125	1354.5455	15
630	679.1667	848.8889	916.66667	1044.1176	20
706.66667	621.25	940	946.55172	1052.381	30
828.35821	658.6207	764.8148	912.5	1004	40
892.72727	776.3889	1252.381	1061.5385	1409.5238	50
736.06557	823.0769	902.1277	1076.4706	882.97872	60
823.52941	810.9375	803.8462	1156.5217	768.29268	70
	800	734.0426	910	791.83673	80
	802.6667	894.8718	793.65079	1286.9565	90
		1117.143	828.88889	1181.8182	100
		1055.172	886.2069	1116	110
		1290.909	1605.8824	871.875	120
		1102.632	1092	1196.2963	130
		1200	1242.5	1351.2821	140
		1427.273	1208.1081	1290	150
		1383.333	1171.1111	1590	160
		1206.122	1079.0698	1865	170
		913.9535	1195	1442.5	180
		1082.857	1567.5	1524.1379	190
		1079.167	1268.75	1332.6923	200
		1011.364	1550	1257.8947	210
		1311.111	1079.5918	1765.2174	220
		1185	1516.6667	1275	230
		1444.737	1040	1206.6667	240
		1317.143	1030.6122	1063.8298	250
		1309.259	1135.1351	1123.6842	260
		993.75	1435.4839	1193.3333	270
		1191.667	1175	1274.359	280
		1068.627	1044.4444	1237.1429	290
		1538.235	1145.283	1404	300
		1260	1217.2414	1202.8571	310
		1009.091	951.78571	1060.9756	320
		1036.667	1228.169	683.33333	330
		867.1642	1168.8889	935.84906	340
		1073.077	1255.7692	781.13208	350
		1030.612	787.95181	772.91667	360
		891.4894	898.46154	853.19149	370
		1014.286	870.45455	909.52381	380
		769.8413	904	730.88235	390
		713.1148	960.31746	580.30303	400
		863.1579	763.88889	594.64286	410
		589.1089	526.19048	615.68627	420
		470.4545	650	486.66667	430
		488.8889	694	486.59794	440
		522.5806	488.20513	505.19481	450
		906.5217	422.22222	410.34483	460
		1057.143	497.33333	415.47619	470
		1118.421	556.33803	542.85714	480
		918.1818	1501.7857	1234.7826	490
		524.7788	635.59322	179.16667	500
		598.8889	1454.7619	176.06383	510
		334.8837	852.38095	81.896552	520
		120.5479	373.28244	65.909091	530
		62.0438	165.80645	44.827586	540
		46.04317	75.603217	52.929293	550
			33.893557	64.031621	560
			39.617084	37.272727	570
			35.764376	34.320323	580
			41.176471	43.243243	590
				31.674528	600
				40	610
				46.052632	620

Table 2b

Dry/Wet Ratio: Site II

D/W IIA	D/W IIB	D/W IIC	D/W IID	D/W IIE	Depth
0.140625	0.1081967	0.0826446	0.1078431	0.06	0
0.1270492	0.0905512	0.088785	0.1072797	0.0359712	5
0.1212121	0.0773067	0.0794979	0.1108108	0.1353383	10
0.1303318	0.1093439	0.1017699	0.1132743	0.06875	15
0.1369863	0.1283422	0.1053864	0.0983607	0.0874036	20
0.1239669	0.1386482	0.0961538	0.0955519	0.0867769	30
0.107717	0.1318182	0.1156317	0.0987654	0.0905797	40
0.1007326	0.1141046	0.0739437	0.0860927	0.0662461	50
0.1196078	0.1083333	0.0997877	0.085	0.1017316	60
0.1082803	0.109777	0.1106383	0.0795848	0.1151685	70
	0.1111111	0.119898	0.0990099	0.1121281	80
	0.1107829	0.1005155	0.1119005	0.0721003	90
		0.0821596	0.1076555	0.0780142	100
		0.0865672	0.1013986	0.0822368	110
		0.0718954	0.0586207	0.1028939	120
		0.083151	0.0838926	0.0771429	130
		0.0769231	0.0744879	0.0689046	140
		0.0654762	0.0764463	0.0719424	150
		0.0674157	0.0786713	0.0591716	160
		0.0765625	0.0848126	0.0508906	170
		0.0986239	0.0772201	0.0648298	180
		0.0845411	0.05997	0.0615711	190
		0.0848057	0.0730594	0.0697987	200
		0.0899796	0.0606061	0.0736434	210
		0.0708661	0.0847751	0.0536131	220
		0.077821	0.0618557	0.0727273	230
		0.0647359	0.0877193	0.0765306	240
		0.0705645	0.0884477	0.0859232	250
		0.0709593	0.0809628	0.0817204	260
		0.0914286	0.0651261	0.0773196	270
		0.0774194	0.0784314	0.0727612	280
		0.0855705	0.0873786	0.0747863	290
		0.0610413	0.080303	0.0664894	300
		0.0735294	0.0759162	0.0767544	310
		0.0901639	0.0950764	0.0861345	320
		0.0879765	0.0752916	0.1276596	330
		0.1033951	0.0788091	0.0965392	340
		0.0852459	0.0737589	0.1134904	350
		0.0884477	0.1126187	0.1145585	360
		0.1008584	0.1001541	0.1049107	370
		0.0897436	0.1030445	0.0990566	380
		0.1149635	0.0996016	0.120354	390
		0.1229839	0.0943114	0.1469933	400
		0.1038251	0.1157556	0.1439589	410
		0.1451149	0.1596958	0.139726	420
		0.1752988	0.1333333	0.1704545	430
		0.1698113	0.1259446	0.1704745	440
		0.1606218	0.1700087	0.1652361	450
		0.0993521	0.1914894	0.1959459	460
		0.0864198	0.1674107	0.1939954	470
		0.0820734	0.1523605	0.1555556	480
		0.0982143	0.0624303	0.0749186	490
		0.1600567	0.1359447	0.358209	500
		0.1430843	0.0643185	0.3622351	510
		0.2299465	0.105	0.549763	520
		0.4534161	0.2112903	0.6027397	530
		0.6171171	0.3762136	0.6904762	540
		0.6847291	0.5694656	0.653897	550
			0.7468619	0.6096386	560
			0.7162447	0.7284768	570
			0.7365702	0.744489	580
			0.7083333	0.6981132	590
				0.7594483	600
				0.7142857	610
				0.6846847	620

Table 2c

Bulk Density: Site II

Bulk IIA	Bulk IIB	Bulk IIC	Bulk IID	Bulk IIE	Depth
0.0457255	0.0608176	0.0261094	0.0495941	0.0285096	0
0.0794664	0.0551093	0.056042	0.0944676	0.028376	5
0.0708357	0.0575861	0.0608893	0.1251386	0.1287007	10
0.1131064	0.0845152	0.1109746	0.1407993	0.0730195	15
0.1151078	0.1522531	0.1134246	0.127446	0.093082	20
0.1334619	0.1662233	0.0988945	0.1217374	0.0771872	30
0.1424849	0.1414317	0.1255745	0.1210348	0.0633625	40
0.1152971	0.1217358	0.0484402	0.1060531	0.0798328	50
0.1361587	0.1326911	0.1268638	0.1094984	0.1299832	60
0.0263459	0.1430772	0.1424204	0.085617	0.1224858	70
	0.1477353	0.1519153	0.1233682	0.1365357	80
	0.1346682	0.127645	0.1386462	0.0815032	90
		0.0960012	0.1200153	0.0944369	100
		0.1144672	0.1298806	0.0919665	110
		0.0941052	0.0703542	0.1352039	120
		0.1026014	0.1069631	0.0830268	130
		0.0870652	0.0712973	0.0754878	140
		0.0713565	0.0837257	0.0879004	150
		0.0777321	0.0992161	0.0730411	160
		0.0945937	0.0800723	0.0599423	170
		0.1216623	0.089504	0.0777235	180
		0.1005473	0.0626152	0.0655909	190
		0.087547	0.0709537	0.0778455	200
		0.1009977	0.0618703	0.0867538	210
		0.0835611	0.0864355	0.0619026	220
		0.08481	0.0657758	0.0781008	230
		0.0746937	0.0964773	0.0836718	240
		0.0807447	0.1029964	0.1079376	250
		0.0891059	0.1061154	0.1028793	260
		0.1164404	0.0838446	0.0866152	270
		0.0940374	0.0980642	0.0876263	280
		0.1072492	0.1043256	0.0849087	290
		0.0738619	0.0969007	0.0803378	300
		0.0904365	0.0947865	0.0991329	310
		0.1067753	0.1212527	0.1086419	320
		0.1128705	0.0949418	0.1623187	330
		0.1209788	0.0899779	0.1214733	340
		0.0960645	0.1009486	0.1374173	350
		0.1171791	0.1490225	0.1492361	360
		0.1307626	0.1276965	0.1240552	370
		0.1168667	0.1320053	0.1226062	380
		0.1350089	0.1089273	0.1495034	390
		0.1342248	0.1124077	0.1762281	400
		0.1364772	0.1545559	0.1941152	410
		0.1856223	0.2140636	0.1881851	420
		0.2232268	0.176051	0.2318779	430
		0.216915	0.1412866	0.2099443	440
		0.1978615	0.2242328	0.2099392	450
		0.1317206	0.2600962	0.2613445	460
		0.1121393	0.2138752	0.2485489	470
		0.0988279	0.2049831	0.1872116	480
		0.1233309	0.0711288	0.0890195	490
		0.1886018	0.1701906	0.5065691	500
		0.1958978	0.0863589	0.5911699	510
		0.3269781	0.1377373	0.8969541	520
		0.7473424	0.3185841	1.0394381	530
		1.0697352	0.556892	1.3276274	540
		1.2729637	0.8608181	1.1114166	550
			1.5669829	1.1915133	560
			1.4993238	1.5531172	570
			1.5899596	1.561293	580
			1.4035828	1.3156321	590
				1.6510745	600
				1.4640582	610
				1.4075285	620

Table 2d

Percent Rubbed Fiber: Site II

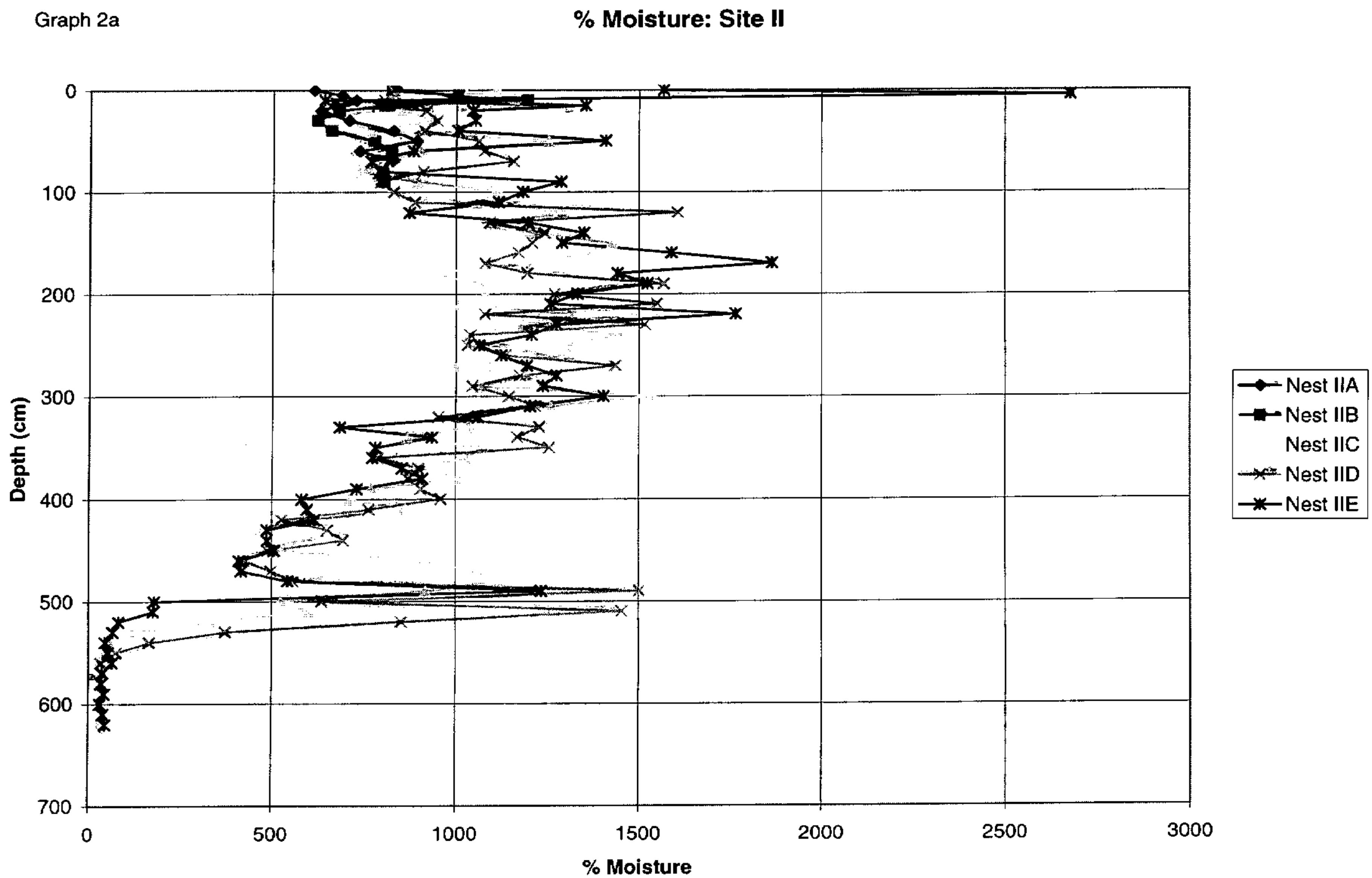
%RF IIA	%RF IIB	%RF IIC	%RF IID	%RF IIE	Depth
53.645224	38.452879	74.885993	69.545455	111.57113	0
43.030348	48.015123	84.859409	30.52357	149.91815	5
41.633466	36.437983	73.85804	21.67092	49.535511	10
37.1261	31.499843	39.902891	41.185979	79.620853	15
40.157171	29.578755	41.658537	37.097304	48.184526	20
42.667997	29.96695	50.514286	35.576829	51.654297	30
30.740338	29.14742	46.11267	38.983957	37.79817	40
41.06421	26.057152	50.556297	31.03347	44.440381	50
36.921443	20.276794	39.965211	27.654549	42.06995	60
45.201536	32.9917	34.592738	52.199716	55.528987	70
	41.733871	21.280772	34.827586	35.28276	80
	38.621559	42.651533	17.654437	40.216535	90
		34.605042	38.149209	41.711322	100
		41.795183	39.411614	30.4308	110
		64.533788	91.714105	35.01305	120
		43.243312	58.408	47.811619	130
		52.389878	62.783582	75.916564	140
		66.531726	59.768179	58.945062	150
		73.804878	68.837016	85.887187	160
		82.437709	48.780888	77.021314	170
		34.860876	57.076396	58.652319	180
		53.766234	75.870425	71.51256	190
		57.408309	52.644231	53.663766	200
		53.226228	66.189112	52.713706	210
		63.638344	52.53243	63.99303	220
		35.694444	43.65	92.653638	230
		42.739755	29.503106	61.204823	240
		24.527473	22.65756	51.346142	250
		20.744739	28.015886	49.009993	260
		19.589552	43.53924	70.572483	270
		20.543406	41.843629	50.379487	280
		25.864994	35.161326	37.606277	290
		24.947746	22.98984	18.883717	300
		35.717172	24.275059	47.56585	310
		31.495482	26.917739	46.887322	320
		49.42029	60.664668	30.52811	330
		31.229372	60.599957	48.997634	340
		19.902503	56.975975	46.742982	350
		28.350357	28.759573	42.587753	360
		31.387931	26.489796	25.887814	370
		33.504226	28.31306	44.578769	380
		30.29298	51.931034	43.847471	390
		22.333772	38.997759	22.336276	400
		44.972353	15.659617	25.959136	410
		23.271971	21.269207	15.518633	420
		25.600887	13.222331	23.725058	430
		23.671024	20.131846	20.28257	440
		34.349277	21.590863	20.10884	450
		63.665532	10.00224	22.498084	460
		67.364185	33.478859	26.275554	470
		61.914013	41.630955	30.634615	480
		64.467794	101.11473	67.718418	490
		63.392186	37.834666	51.574288	500
		114.52671	72.006931	86.406309	510
		68.555171	53.681336	75.990021	520
		81.550515	84.107422	75.775207	530
		85.374629	91.118764	81.086155	540
		96.220033	87.621318	73.531224	550
			80.684606	88.508098	560
			97.364545	92.932146	570
			51.496832	72.187145	580
			2.4184406	43.824886	590
				18.526837	600
				5.2485232	610
				9.4225579	620

Table 2e

Percent Organic Content: Site II

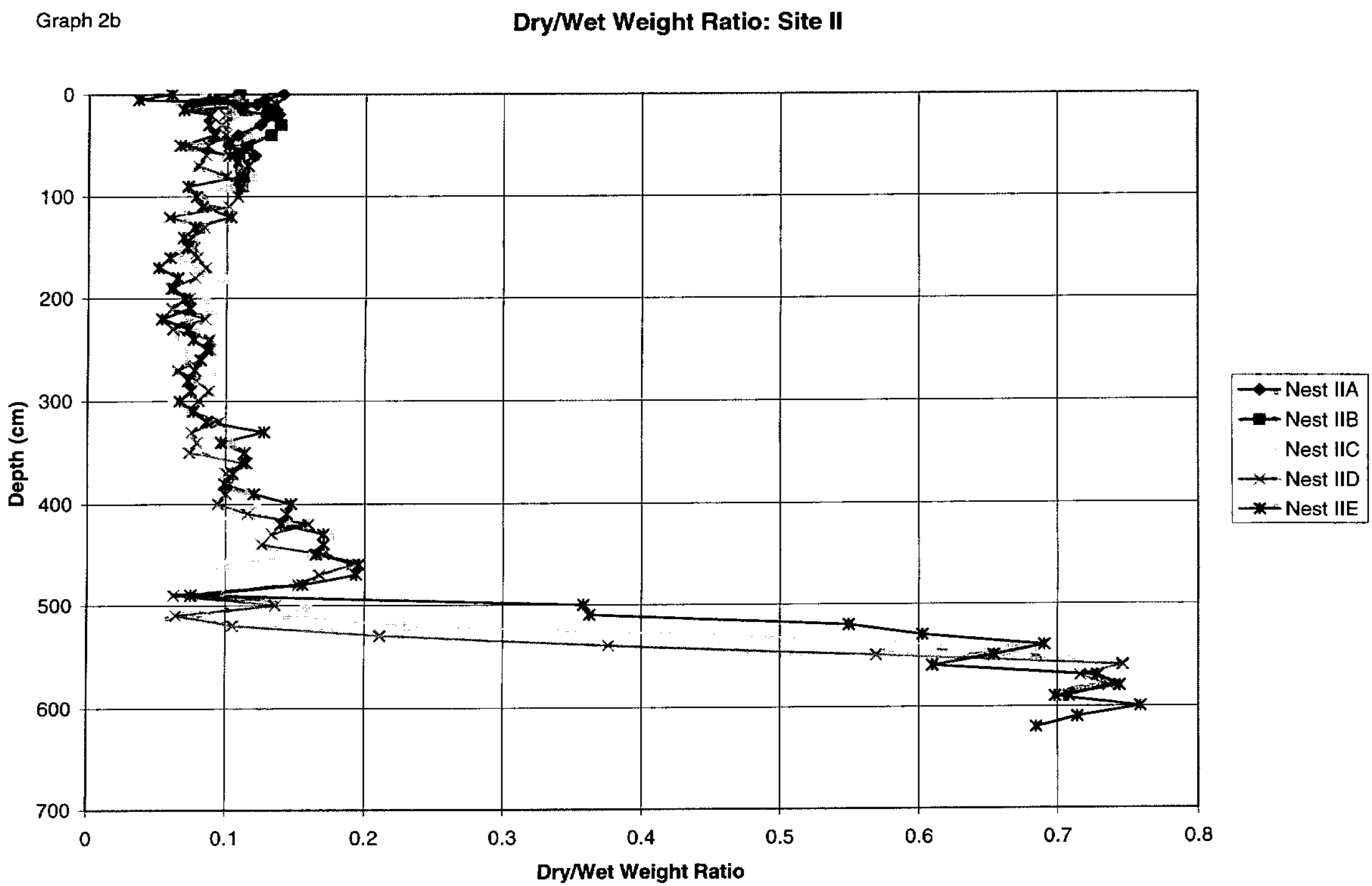
%OC IIA	%OC IIB	%OC IIC	%OC IID	%OC IIE	Depth
90.254794	89.990956	94.358508	104.7619	42.222222	0
85.368749	88.471284	92.217484	123.33333	64.777778	5
90.194175	91.414309	92.893145	102.22222	92.733333	10
88.774762	92.560775	93.028053	101.5873	105.26316	15
91.809444	91.622378	92.507205	95.3125	85.365854	20
93.80531	92.517606	93.211792	95	49.222222	30
93.954769	94.196429	93.569432	85	88	40
93.991891	95.754328	93.129062	94.230769	114.28571	50
93.061917	94.062797	90.886392	97.222222	86.42	60
92.941408	93.883936	90.558767	78.431373	90.243902	70
	94.749403	88.4591	92.592593	95.918367	80
	92.997236	92.132558	82.8125	96.551724	90
		92.964687	75.555556	81.578947	100
		94	100	100	110
		94.917582	100	47	120
		91.535732	104	96.875	130
		94.215404	95.652174	93.023256	140
		95.099183	90	127.58621	150
		95.385839	100	72.941176	160
		95.562859	126.31579	80.769231	170
		86.28624	107.31707	95.121951	180
		88.879826	112.82051	100	190
		90.244874	115.625	95.116732	200
		91.883478	80	96.064876	210
		91.167081	87.5	97.184929	220
		91.455139	91.176471	94.353693	230
		90.313536	85.454545	92.357779	240
		83.995427	84.444444	91.183496	250
		66.367467	57.142857	92.049009	260
		61.891473	51.162791	93.076193	270
		65.965196	54.054054	91.031504	280
		61.712408	69.565217	83.213496	290
		76.546392	90.566038	79.038971	300
		60.5162	75	69.94488	310
		58.147022	57.407407	61.702128	320
		57.762519	50.684932	38.573221	330
		55.178017	62	58.043927	340
		58.086304	103.27869	44.977761	350
		67.233698	61.728395	50.58504	360
		57.206255	60	55.910749	370
		50.735755	40.816327	59.548207	380
		46.987573	63.461538	46.672517	390
		53.716051	55.223881	43.564205	400
		52.130755	50.704225	49.815173	410
		49.866429	53.75	49.202077	420
		32.646748	38.961039	47.420965	430
		33.14121	27.083333	43.949045	440
		76.254215	33.846154	53.290676	450
		59.94109	20.37037	41.387506	460
		62.86509	5.0632911	23.86336	470
		68.505338	16.176471	28.560498	480
		42.242563	69.230769	73.438146	490
		26.944988	29.090909	10.066994	500
		22.561043	70	9.7476885	510
		17.891521	52.459016	4.6246229	520
		6.3541488	20.610687	2.3776343	530
		3.6161081	0	3.2763992	540
		1.9640914	4.2895442	2.4346515	550
			1.7241379	3.338231	560
			2.0467836	1.3469114	570
			2.2695035	1.2636741	580
			5.9322034	0.1498771	590
				2.2374043	600
				2.8849764	610
				3.506555	620

Graph 2a

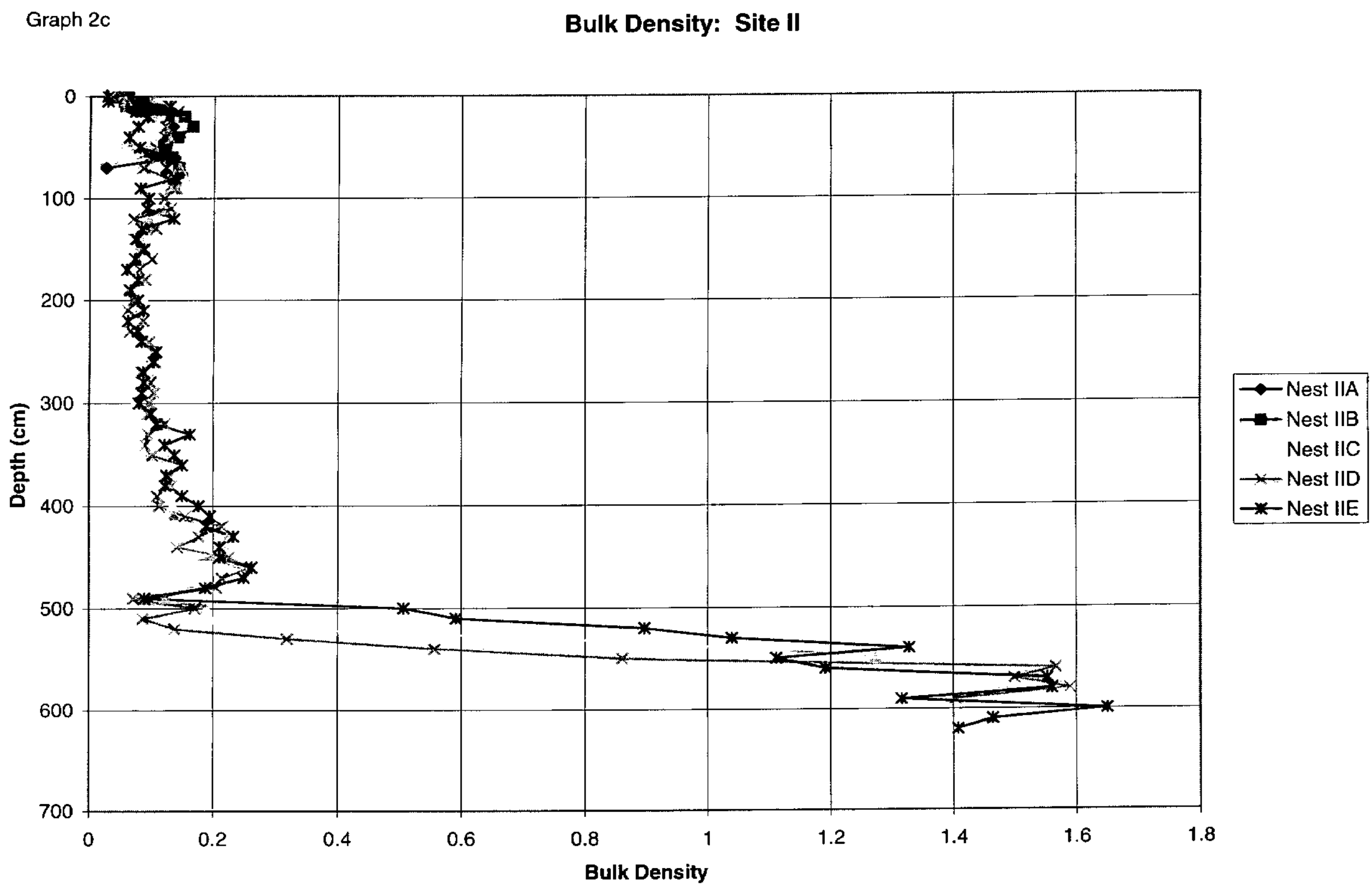


% Moisture: Site II
Depth (cm)
0
100
200
300
400
500
600
700
0
500
1000
1500
2000
2500
3000
% Moisture
Nest IIA
Nest IIB
Nest IIC
Nest IID
Nest IIE

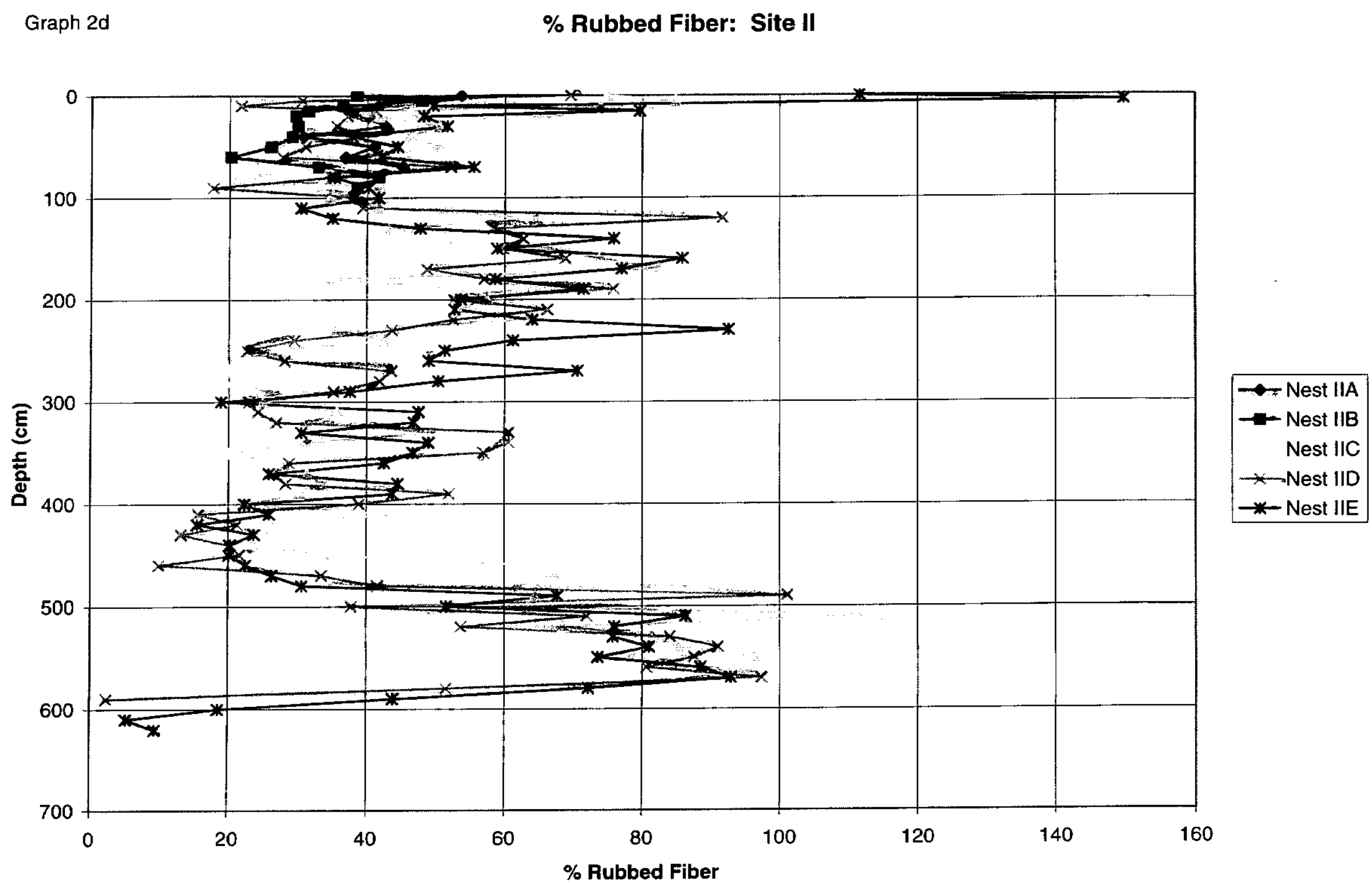
Graph 2b


Dry/Wet Weight Ratio: Site II
Depth (cm)
0
100
200
300
400
500
600
700
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Dry/Wet Weight Ratio
Nest IIA
Nest IIB
Nest IIC
Nest IID
Nest IIE

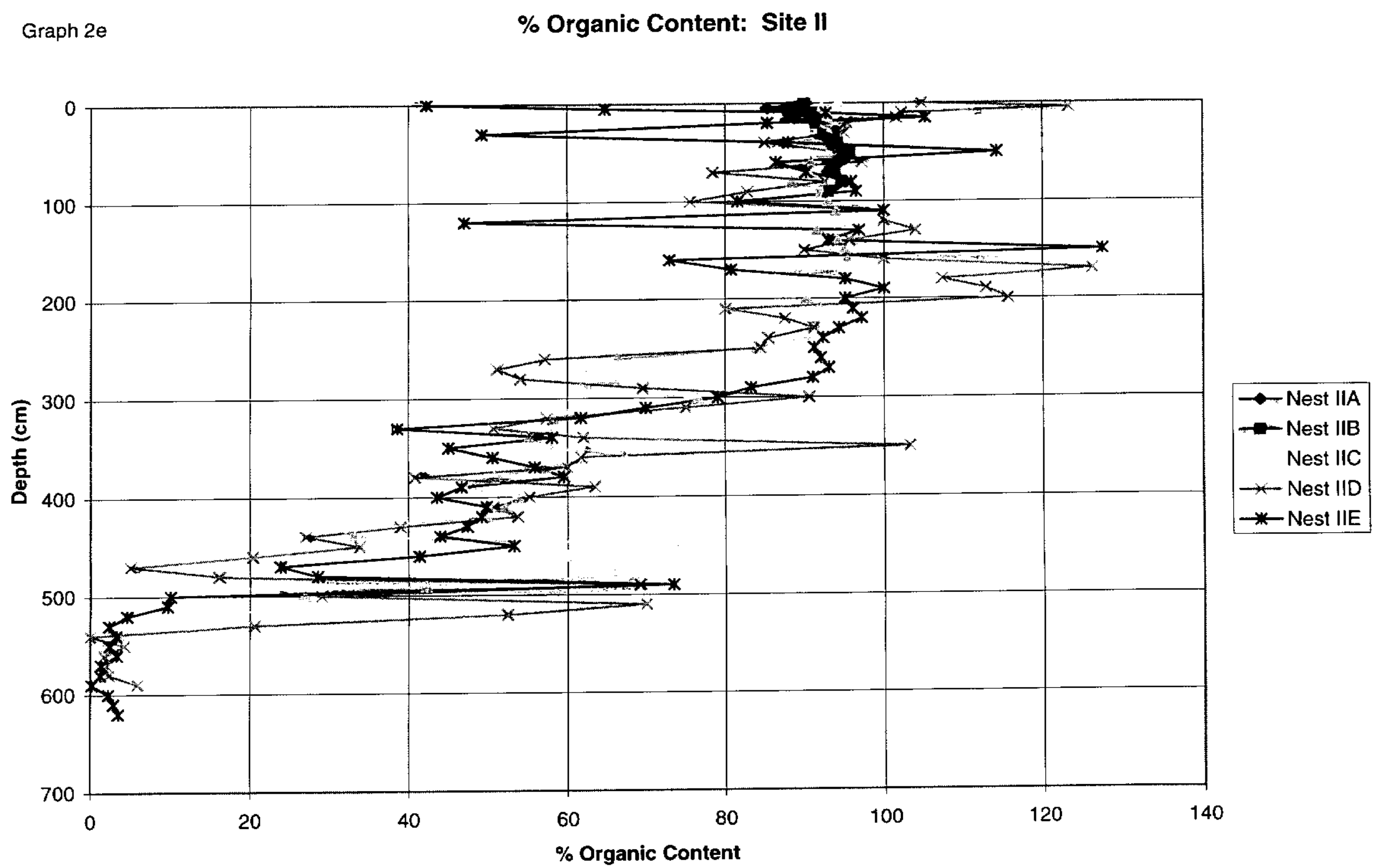
Graph 2c


Bulk Density: Site II
Depth (cm)
0
100
200
300
400
500
600
700
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Bulk Density
Nest IIA
Nest IIB
Nest IIC
Nest IID
Nest IIE

Graph 2d


% Rubbed Fiber: Site II
Depth (cm)
0
100
200
300
400
500
600
700
0
20
40
60
80
100
120
140
160
% Rubbed Fiber
Nest IIA
Nest IIB
Nest IIC
Nest IID
Nest IIE

Graph 2e


% Organic Content: Site II
Depth (cm)
0
100
200
300
400
500
600
700
0
20
40
60
80
100
120
140
% Organic Content
Nest IIA
Nest IIB
Nest IIC
Nest IID
Nest IIE

also tend to remain at the higher end of the spectrum compared to nests IIA and IIB.

The plot of D/W against depth (graph 2b) reveals this grouping effect again: nests IIA and IIB move similarly by decreasing at shallow depths, increasing at intermediate depths, and once again decreasing as depths continue to increase--all while remaining at the higher end of the spectrum compared to the grouping portrayed by nests IIC, IID, and IIE. This latter grouping move similarly in that they fluctuate a bit while increasing slightly progressing from shallow depths through higher intermediate depths, then they all decrease sharply at around 500 cm depth and then severely increase over about 50 cm, then remain relatively constant over the last 50 cm.

The next graph (2c) reveals the trends seen as bulk density (BULK) is plotted against depth at site II. Again, we see nests IIA and IIB moving similarly higher on the spectrum while nests IIC, IID, and IIE move similarly lower on the spectrum relative to the former grouping. Nests IIA and IIB increase at shallow depths, and then IIA and IIB split--IIA shows a decrease in BULK as depth continues to increase past intermediate depths and IIB remains relatively constant as depths increase. Nests IIC, IID, and IIE move much like they did in the plot of D/W: a gradual increase, sharp decrease at a depth around 500 cm, a severe increase over the next 50 cm, and then a more gradual increase at the largest depths, all movements including fluctuations along the trends.

The plot of %RF against depth again reveals the two groupings (please see graph 2d), yet this plot shows great fluctuation throughout the trends. Nests IIA and IIB move similarly by decreasing at shallow and intermediate depths and then increasing as depths continue to increase. Nests IIC, IID, and IIE move similarly in that they show a gradual decrease at intermediate depths, an increase as depth continues past 450 cm and then a sharp decline in nests IID and IIE at depths of 570 cm and deeper. There is no clear distinction between the groupings in reference to their position on the spectrum.

Again, strong grouping tendencies are revealed as we review graph 2e, that of %OC versus depth. Nests IIA and IIB move very similarly, showing a gradual increase in %OC as depth increases; surprisingly, nest IIC moves very much the same as these two nests at the shallow depths. Nest IIC has been moving somewhat like IIA and IIB in the other plots, yet here it is most pronounced. Nest IIC then joins the latter group of IID and IIE as depths continue to increase, revealing a general decrease in %OC through intermediate depths, a substantial increase around 500 cm depth, then a sharp decrease once again immediately following this action, finally ending up with IID and IIE remaining rather constant at the maximum depths. Thus, the groupings are slightly modified here: nests IIA, IIB, and sometimes IIC move similarly while nests IIC, IID, and IIE move together for the most part.

Comparing Sites I and II

The next section of our research of the peat conditions included comparing the trends of the conditions seen in the three types of environments in which peat was collected in order to see if trends were seen due to environmental conditions. The three types of environments are: the alder area (including nests IA and IB), the cedar swamp (including nests IC, ID, and IE), and the bog (including all nests in site II). Means were taken of the results of peat characteristics of individual nests and then the standard deviation of these values was found; these values are shown on table 3a, 3b, and 3c for the alder area, the cedar swamp, and the bog, respectively. These means were then plotted against depth to reveal trends in the different environments (please refer to graphs 3a - 3e).

Percent moisture is plotted against depth in graph 3a. We see that alders increase overall with a rather sharp increase at a depth around 60 cm while cedars decrease overall with its second lowest peak also around 60 cm in depth. The bog displays a more complicated trend: it fluctuates greatly at short depths (with a rather sharp increase around a depth of 50 cm), then increases at intermediate depths, and then decreases as depth continues to increase. Again, the typical sharp increase and then decrease and stability is shown in the bog area. It is important to note that both the alder area and cedar area are located at the lower end of the spectrum while the bog site is located at the higher end of the spectrum relative to the former sites.

Graph 3b reveals the trends of the three areas as D/W is plotted against depth. This time the alders and cedars are at the higher end of the spectrum while the bog is at the lower end of the spectrum. The bog tends to have small fluctuations while decreasing through shallow depths, increasing though intermediate depths, and having a sharp decrease then severe increase at the maximum depths, finally becoming rather stable at the maximum depth. Meanwhile, the alder area shows a general decrease in D/W and the cedar area shows an overall increase with a sharp decrease around 80 cm.

The plot of bulk density against depth (graph 3c) reveals very similar trends to the above graph: the alder area shows a general decrease with a slight increase in the shallow depths, the cedar area shows an overall increase with a sharp decrease at 80 cm again, and the bog area has the exact same trends as expressed in the above graph.

Percent rubbed fiber is plotted against depth in graph 3d. We see that the %RF in the alder area increased overall while a decrease is shown for the alders. The bogs, on the other hand decreases at shallow depths, increases at the beginning intermediate depths, decreases through the bottom intermediate depths, and then increases through the lower depths; again, there is a sharp change in the trend at the maximum depths. Additionally, alders and cedars are somewhat separated by the bog in that they are located at the lower end of the spectrum while the bog is generally higher on the spectrum.

Table 3a

Mean for Alder Areas (Site I)

% M	%M sd	D/W	D/W sd	Bulk	Bulk sd	%RF	%RF sd	%OC	%OC sd	Depth
621.92547	67.37278275	0.1391243	0.0129836	0.1230871	0.0502916	35.019202	11.459353	77.002485	9.1694118	0.00
525.55556	105.280343	0.1621544	0.0272904	0.1516514	0.0271067	33.335883	6.4938897	80.239259	6.5184293	5.00
675.03415	182.6209522	0.1327107	0.0312706	0.1426211	0.051911	38.124481	14.039973	72.75865	4.2236229	10.00
486.88525	159.9684194	0.1769649	0.0482357	0.210707	0.0499505	31.283734	0.1788473	60.894158	20.262186	15.00
525.73517	278.467617	0.1773765	0.0789369	0.2208478	0.0968072	25.962934	4.5378592	61.633892	21.728401	20.00
586.50452	344.9694856	0.1667137	0.0837739	0.2146344	0.1110524	34.102534	1.0063076	67.043772	26.332	30.00
706.88034	229.1146844	0.1291403	0.0366695	0.1440495	0.048899	33.496646	5.1899912	80.175457	1.6015679	40.00
621.04054	226.331503	0.145875	0.0457895	0.1765042	0.0628058	40.001284	1.1278977	72.674284	13.037394	50.00
898.44136	493.6434655	0.1141019	0.0564136	0.148386	0.0894567	42.21184	16.76482	84.261918	1.4217007	60.00
855.5787	356.1395682	0.112459	0.0419129	0.1379979	0.0514901	49.084168	11.008972	79.551606	8.9021061	70.00
789.16667	137.8858223	0.1138336	0.0176525	0.1236493	0.0429688	47.038716	8.4052152	83.478259	5.2723227	80.00
759.18367	#DIV/0!	0.1163895	#DIV/0!	0.1193178	#DIV/0!	52.673572	#DIV/0!	88.401846	#DIV/0!	90.00

Table 3b

Mean for Cedar Area (Site I)

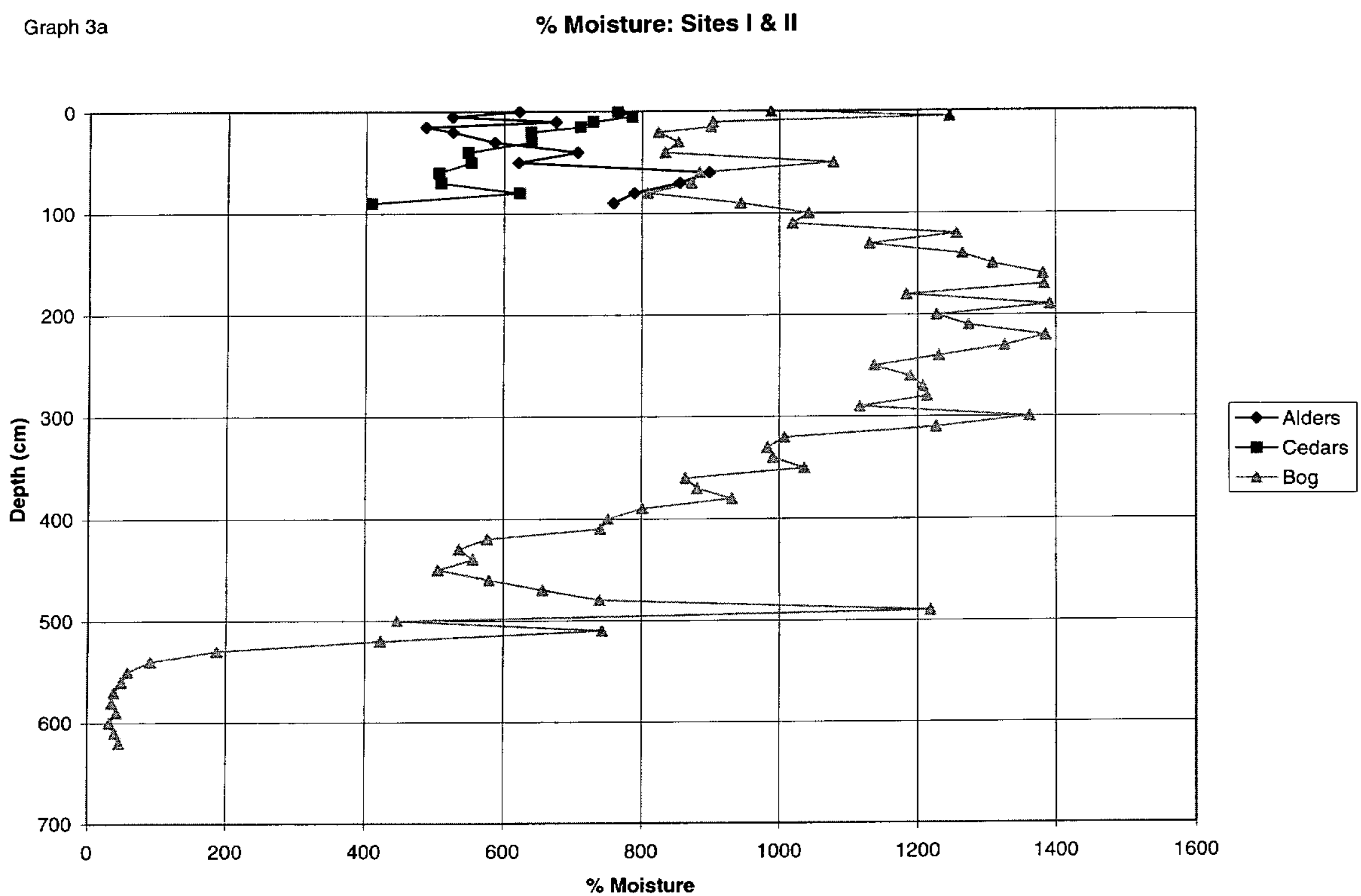
% M	% M sd	D/W	D/W sd	Bulk	Bulk sd	%RF	%RF sd	%OC	%OC sd	Depth
764.98484	68.878237	0.1160807	0.0088886	0.0987857	0.016816	59.465878	2.0462471	78.079598	23.461321	0.00
785.78644	52.773179	0.1131546	0.006561	0.1027661	0.0427674	42.790227	16.544956	79.134931	7.531263	5.00
729.66623	255.49891	0.1302139	0.0473896	0.1436188	0.0694382	43.753394	22.16634	72.647234	35.097581	10.00
711.01549	357.41547	0.1484716	0.0860766	0.1869739	0.1355059	39.575603	20.34092	69.396745	37.697865	15.00
639.11236	340.42147	0.1564115	0.0712505	0.1922566	0.1077058	35.372678	16.443187	54.524332	35.077986	20.00
639.88542	325.30334	0.1609293	0.0891565	0.2001753	0.1200958	34.467589	4.662644	57.332372	31.959107	30.00
547.71235	203.14229	0.1676629	0.0635913	0.2091999	0.0970614	32.956298	6.7227891	76.256805	18.582715	40.00
552.81504	407.5319	0.190255	0.1187702	0.2372812	0.1553368	22.247054	7.4409406	59.687153	39.445642	50.00
506.19621	304.38452	0.1887586	0.0947799	0.2591222	0.1574709	35.2604	1.2099734	57.800197	43.008584	60.00
509.15152	149.22096	0.1692407	0.0414581	0.2341902	0.0451135	27.746783	5.2757092	79.209745	10.453248	70.00
622.69737	56.289421	0.1387915	0.0108102	0.105367	0.0959693	40.705472	10.308397	85.960513	2.1848592	80.00
408.79121	#DIV/0!	0.1965443	#DIV/0!	0.2363226	#DIV/0!	33.818463	#DIV/0!	60	#DIV/0!	90.00

Table 3c

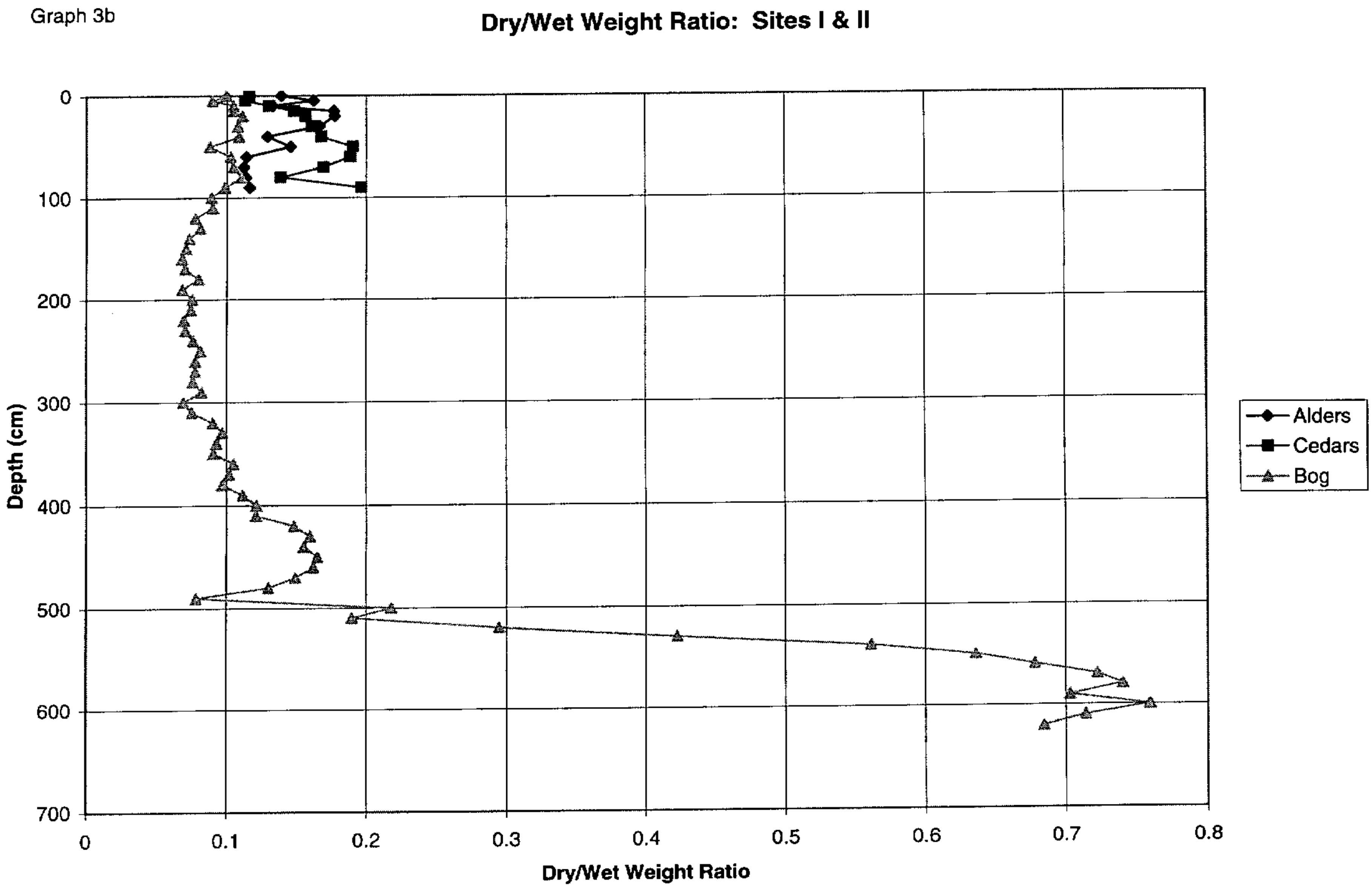
Mean for Bog (Site II)

% M	%M sd	D/W	D/W sd	Bulk	Bulk sd	%RF	%RF sd	%OC	%OC sd	Depth
987.85859	368.9288703	0.0998619	0.0303323	0.0421512	0.0146632	69.620135	27.450938	84.317677	24.280895	0
1245.9806	813.4284655	0.0899273	0.0338825	0.0626923	0.0253494	71.26932	48.396133	90.833726	21.050527	5
903.55421	255.4111123	0.1048332	0.025662	0.0886301	0.0353145	44.627184	19.245454	93.891437	4.7839754	10
900.35697	265.5705008	0.104694	0.0226554	0.104483	0.0265708	45.867133	19.232938	96.24281	6.8846579	15
823.76797	170.4925011	0.1112958	0.0207585	0.1202627	0.0217204	39.335258	6.7930203	91.323476	3.6445952	20
853.36987	181.1039151	0.1082195	0.0220211	0.1195008	0.0339041	42.076072	9.3830595	84.751386	19.882289	30
833.65874	132.8890419	0.1089024	0.0158926	0.1187777	0.0323936	36.556511	6.84611	90.944126	4.1992317	40
1078.5119	257.8185752	0.0882239	0.0194793	0.0942718	0.0301834	38.630302	9.9712867	98.278353	8.9983082	50
884.14389	125.4698117	0.1028921	0.0126504	0.127039	0.0103861	33.37759	9.1637441	92.330666	4.0151036	60
872.6255	160.0225336	0.1046898	0.0142673	0.1039893	0.0492772	44.102935	10.139315	89.211877	6.2216556	70
808.96982	73.47378867	0.1105368	0.0086287	0.1398886	0.0127851	33.281247	8.5995248	92.929866	3.2834617	80
944.53644	232.8172389	0.0988248	0.0185385	0.1206157	0.0264687	34.786016	11.540642	91.123504	5.8613827	90
1042.6166	187.897283	0.0892764	0.0160511	0.1034845	0.0143375	38.155191	3.5531439	83.366396	8.8411363	100
1019.1264	119.0617568	0.0900675	0.010049	0.1121047	0.0190672	37.212532	5.9928513	98	3.4641016	110
1256.2221	368.2310233	0.0778033	0.0227202	0.0998877	0.0328093	63.753648	28.358577	80.639194	29.243021	120
1130.3093	57.39312846	0.0813955	0.0037015	0.0975305	0.0127484	49.820977	7.7794652	97.470244	6.2534173	130
1264.594	78.02354743	0.0734385	0.0041109	0.0779501	0.0081672	63.696675	11.789891	94.296945	1.3163545	140
1308.4603	110.7423541	0.0712883	0.0055142	0.0809942	0.0086035	61.748322	4.1629425	104.22846	20.388442	150
1381.4815	209.4505844	0.0684196	0.0097885	0.0833297	0.0139565	76.176361	8.7689811	89.442339	14.475458	160
1383.3974	421.8902586	0.0707552	0.0176909	0.0782028	0.0174012	69.413304	18.072265	100.88263	23.234612	170
1183.8178	264.4506276	0.0802246	0.0170962	0.0962966	0.0227433	50.19653	13.30442	96.241755	10.56004	180
1391.4984	268.1690083	0.0686941	0.0137472	0.0762511	0.0210937	67.04974	11.70839	100.56678	11.980403	190
1226.8697	131.8494784	0.0758879	0.0078932	0.0787821	0.0083362	54.572102	2.5085685	100.32887	13.468945	200
1273.0861	269.6393272	0.074743	0.0147176	0.0832073	0.0198034	57.376349	7.6363778	89.316118	8.3344805	210
1385.3068	348.7826661	0.0697514	0.0156109	0.0772997	0.0134115	60.054601	6.5168049	91.95067	4.8897821	220
1325.5556	171.5155754	0.0708013	0.0081551	0.0762289	0.0096542	57.332694	30.846386	92.328434	1.7594513	230
1230.4678	203.4154606	0.0763286	0.011493	0.0849476	0.0109477	44.482561	15.922555	89.375287	3.5459685	240
1137.195	156.7219982	0.0816451	0.0096787	0.0972263	0.0144857	32.843725	16.050817	86.541123	4.0266771	250
1189.3595	103.9939365	0.0778808	0.0060062	0.0993668	0.0090324	32.590206	14.677345	71.853111	18.088092	260
1207.5224	221.2084999	0.0779581	0.0131629	0.0956334	0.0180726	44.567092	25.507003	68.710152	21.772784	270
1213.6752	53.21027676	0.076204	0.0030242	0.0932426	0.0052642	37.588841	15.366371	70.350251	18.874705	280
1116.7383	104.9721695	0.0825785	0.0068085	0.0988279	0.0121427	32.877532	6.194854	71.49704	10.879942	290
1362.5061	199.7352753	0.0692779	0.009929	0.0837001	0.0118817	22.273768	3.0947827	82.050467	7.479268	300
1226.6995	29.72235978	0.0754	0.0016733	0.0947853	0.0043482	35.852694	11.645986	68.487026	7.3511304	310
1007.2841	54.61736718	0.0904583	0.0044782	0.1122233	0.0078752	35.100181	10.461427	59.085519	2.2960266	320
982.723	276.3944984	0.0969759	0.0273193	0.123377	0.0348956	46.871023	15.229153	49.00689	9.7040793	330
990.63404	158.147071	0.0929144	0.0126874	0.11081	0.0180428	46.942321	14.79277	58.407315	3.425478	340
1036.6594	239.4050621	0.0908317	0.0204462	0.1114768	0.0225975	41.207153	19.146661	68.780918	30.586445	350
863.82691	144.6358384	0.1052083	0.0145475	0.1384792	0.0184468	33.232561	8.1044169	59.849044	8.481947	360
881.04746	24.37456195	0.1019744	0.0025672	0.1275048	0.0033578	27.921847	3.0167698	57.705668	2.0898693	370
931.42136	74.37390807	0.0972816	0.0068258	0.1238261	0.0076426	35.465352	8.3082992	50.366763	9.37139	380
801.57454	90.8167402	0.1116397	0.0107681	0.1311465	0.0205619	42.023828	10.933691	52.373876	9.6034893	390
751.24508	192.8553426	0.1214295	0.0263753	0.1409535	0.0324379	27.889269	9.6202348	50.834712	6.3414192	400
740.56321	135.768725	0.1211799	0.0206094	0.1617161	0.0294786	28.863702	14.870659	50.883384	1.1681407	410
576.99522	45.9611858	0.1481789	0.0103315	0.195957	0.015733	20.019937	4.0248064	50.939502	2.4565251	420
535.70707	99.31195036	0.1596956	0.0229585	0.2103852	0.0300473	20.849425	6.6715148	39.676251	7.4130302	430
556.49561	119.0878049	0.1554101	0.0255201	0.1893819	0.0417974	21.361813	2.0012546	34.724529	8.5436075	440
505.32686	17.18813894	0.1652888	0.0046937	0.2106778	0.0132012	25.34966	7.8290439	54.463682	21.228351	450
579.69626	283.1014606	0.1622625	0.0545276	0.2177204	0.0744807	32.055285	28.079214	40.566322	19.798137	460
656.65079	349.2428491	0.1492753	0.0560339	0.1915211	0.070899	42.372866	21.940748	30.597247	29.483401	470
739.20541	328.4795465	0.1299965	0.0415333	0.1636742	0.0568572	44.726528	15.867801	37.747436	27.347348	480
1218.25	292.1529926	0.0785211	0.018162	0.0944931	0.026528	77.76698	20.284962	61.63716	16.927442	490
446.51288	238.0660843	0.2180701	0.1219611	0.2884538	0.1891175	50.933714	12.790796	22.034297	10.419381	500
743.23821	651.4558589	0.1898793	0.1543726	0.2911422	0.2655413	90.979983	21.625719	34.10291	31.741082	510
423.05374	392.736575	0.2949032	0.2293863	0.4538898	0.3951993	66.075509	11.359176	24.99172	24.694978	520
186.57983	163.9809481	0.4224821	0.1975496	0.7017882	0.3625797	80.477715	4.2684458	9.7808234	9.5873681	530
90.892611	65.44587143	0.561269	0.1644065	0.9847515	0.3923327	85.85985	5.033874	2.2975024	1.9969323	540
58.191892	15.46675061	0.6360306	0.0596726	1.0817328	0.20767	85.790858	11.454626	2.8960957	1.229484	550
48.962589	21.31082881	0.6782502	0.0970316	1.3792481	0.2654971	84.596352	5.5320439	2.5311845	1.1413361	560
38.444906	1.657710502	0.7223608	0.0086494	1.5262205	0.0380377	95.148346	3.1341798	1.6968475	0.4948844	570
35.042349	1.021099571	0.7405296	0.0055994	1.5756263	0.0202704	61.841988	14.63026	1.7665888	0.7112288	580
42.209857	1.46142896	0.7032233	0.0072267	1.3596075	0.0621905	23.121663	29.278778	3.0410403	4.0887221	590
31.674528	#DIV/0!	0.7594483	#DIV/0!	1.6510745	#DIV/0!	18.526837	#DIV/0!	2.2374043	#DIV/0!	600
40	#DIV/0!	0.7142857	#DIV/0!	1.4640582	#DIV/0!	5.2485232	#DIV/0!	2.8849764	#DIV/0!	610
46.052632	#DIV/0!	0.6846847	#DIV/0!	1.4075285	#DIV/0!	9.4225579	#DIV/0!	3.506555	#DIV/0!	620

Graph 3a

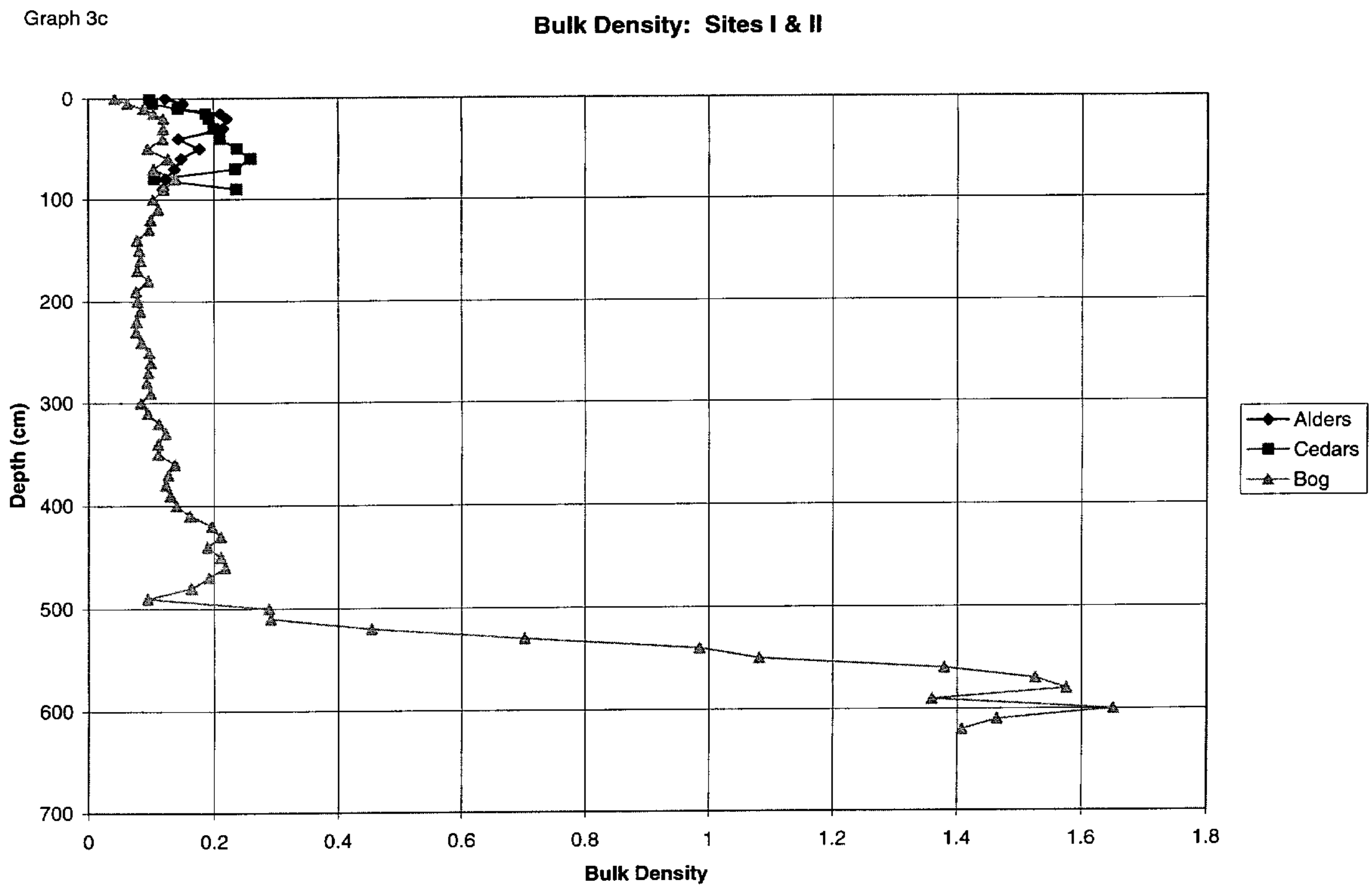

% Moisture: Sites I & II
Depth (cm)
0
100
200
300
400
500
600
700
0
200
400
600
800
1000
1200
1400
1600
% Moisture
Alders
Cedars
Bog

Graph 3b



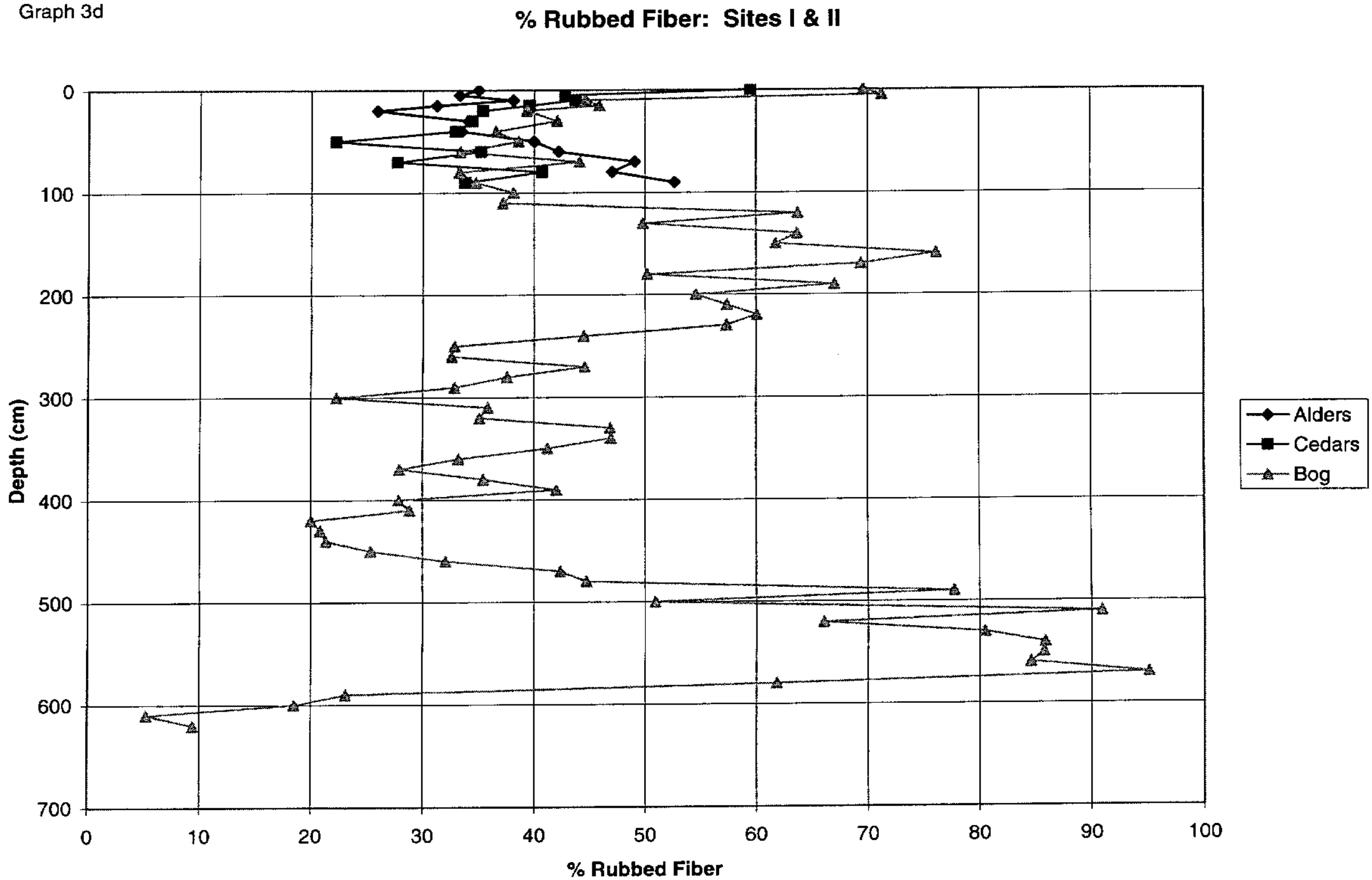
Dry/Wet Weight Ratio: Sites I & II
Depth (cm)
0
100
200
300
400
500
600
700
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Dry/Wet Weight Ratio
Alders
Cedars
Bog

Graph 3c



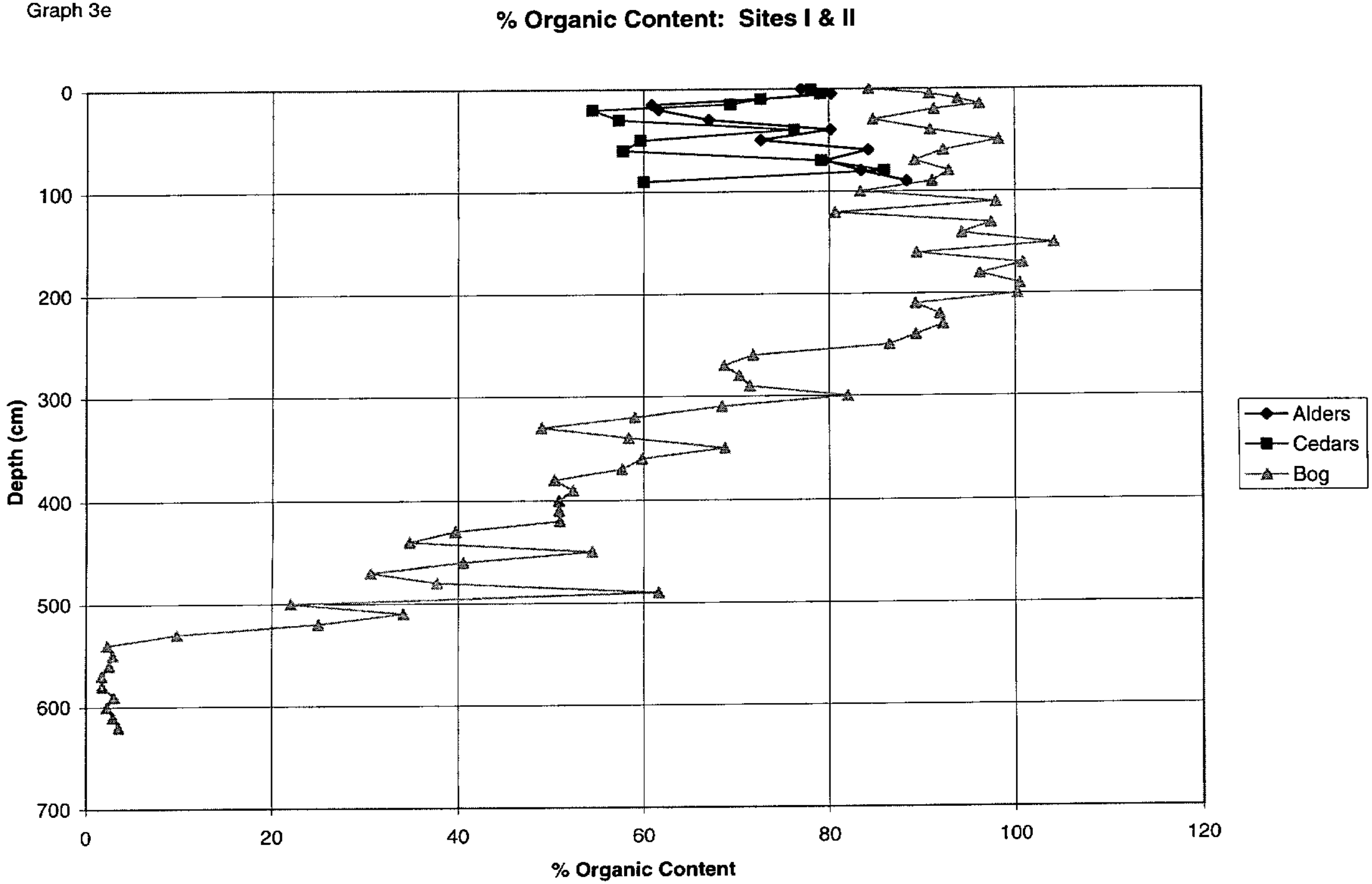
Bulk Density: Sites I & II
Depth (cm)
0
100
200
300
400
500
600
700
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Bulk Density
Alders
Cedars
Bog

Graph 3d



% Rubbed Fiber: Sites I & II
Depth (cm)
0
100
200
300
400
500
600
700
0
10
20
30
40
50
60
70
80
90
100
% Rubbed Fiber
Alders
Cedars
Bog

Graph 3e



% Organic Content: Sites I & II
Depth (cm)
0
100
200
300
400
500
600
700
0
20
40
60
80
100
120
% Organic Content
Alders
Cedars
Bog

A clear-cut separation occurs between the areas in site I and the bog in the plot of the %OC and depth (graph 3e): alders and bogs are lower on the spectrum than the bog. The bog shows a total decrease in %OC as depths increase, while the alders decrease at very shallow depths and then increase though the remaining depth, and the cedars fluctuate greatly.

Alder Allometrics

The alder allometrics study resulted in the measurement of the basal diameter, maximum height, and perpendicular canopy diameter presented in table 4a. Also presented in this table are the calculations of the area of the ellipse, or canopy area, formed by the perpendicular canopy diameter measurements and the total dry weight of the samples. Table 4b presents the calculations of the natural log of the basal diameter, maximum height, and area of the ellipse. Graph 4a reveals the total dry weight trend of the samples as basal diameter increases, graph 4b reveals the trends of the total dry weight of the two types of samples as maximum height increases, and graph 4c relates the samples' total dry weight to increasing canopy area. All trends show obvious positive trends as each physical dimension increases.

After looking at the plots of the samples from two different plots, we confidently plotted these samples as being of the same type. Therefore, we arrived at graphs 4d, 4e, and 4f which show the trend lines of the relations between total dry weight, maximum height, and canopy area, respectively. Equations for these lines, revealed on the graphs, are $y = 28.407x^{2.6975}$ for the plot of total dry weight against basal diameter using a second power relation (revealing a maximum correlation coefficient of $R^2 = .978$), $y = 3.401E\text{-}05^{x2.8666}$ and $R^2 = .9317$ for the plot of total dry weight against maximum height using a second power relation, and $y = 2E\text{-}06x^2 + 0.0551x - 5.0307$ and $R^2 = 0.8216$ for the plot of total dry weight against canopy area using an exponential relation.

Additionally, we plotted total dry weight against the natural logs of the physical dimensions to see if a stronger relation would be observed (please refer to graphs 4g, 4h, and 4i). Indeed, the correlation coefficients of all the relationships increased. The following equations for the trend lines were observed and recorded on the appropriate graphs: $y = 28.407e^{2.6975x}$ and $R^2 = 0.978$ for the trend line of the plot of total dry weight against the natural log of basal diameter using an exponential relationship, $y = 2.7616E\text{-}09e^{14.791x}$ and $R^2 = 0.93964$ for the trend line relating the total dry weight and the natural log of maximum height using an exponential relationship, and $y = 0.0654e^{0.9695x}$ and $R^2 = 0.8039$ for the trend line relating the total dry weight and the canopy area in an exponential relationship. All specific relationships were chosen so that the correlation would be strongest (thus revealing the highest correlation coefficient).

Statistical analyses, including multiple regressions, were completed to ensure that the single natural log relationships indeed revealed the strongest

Table 4a

Physical Dimensions: NIH

Sample	Basal Diam.	Max Hgt.	Can. Diam. 1	Can. Diam. 2	Area of Ellipse	Total Dry Wght.
1	0.9	97	32	22	552.91984	20.0647
2	1.15	158	44	29	1002.16721	53.731
3	1	122	40	29	911.0611	32.1211
4	1.27	129	28	38	835.66294	40.135
5	0.52	63	14	5	54.977825	4.92902
6	1.31	150	58	41	1867.675255	51.353
7	1.83	171	94	60	4429.6419	127.474
8	1.48	151	53	47	1956.425173	63.2144
9	0.83	120	28	17	373.84921	17.9691
10	0.99	120	60	30	1413.7155	33.059
11	0.97	141	30	12	282.7431	23.098
12	2.12	240	60	72	3392.9172	250.121
13	2	273	73	38	2178.692665	244.064
14	0.91	136	13	16	163.36268	30.7539
15	0.89	90	55	27	1166.315288	18.8167

Physical Dimensions: RFI

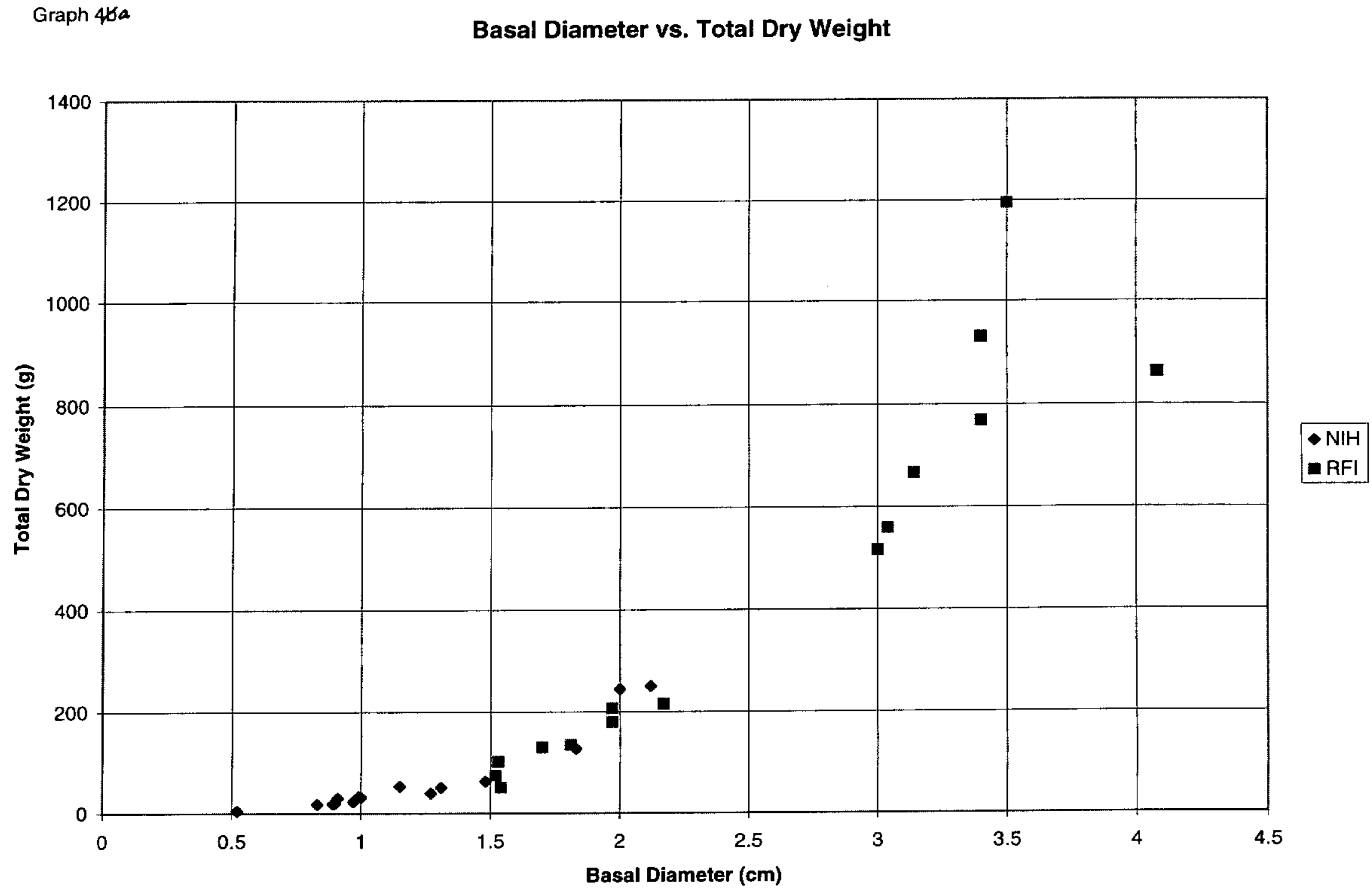
Sample	Basal Diam.	Max Hgt.	Can. Diam. 1	Can. Diam. 2	Area of Ellipse	Total Dry Wght.
1	3.4	350	140	120	13194.678	930.885
2	3.4	365	130	109	11129.08258	768.316
3	1.97	225	97	72	5485.21614	179.036
4	3.5	417	120	142	13383.1734	1194.79
5	1.53	214	72	50	2827.431	103.047
6	4.08	330	61	119	5701.200453	862.842
7	3	371	54	69	2926.391085	515.134
8	1.7	216	121	33	3136.092218	130.872
9	3.04	280	190	67	9998.110175	559.174
10	1.81	182	48	63	2375.04204	135.233
11	1.97	226	80	55	3455.749	206.531
12	2.17	160	74	89	5172.627935	214.573
13	1.54	135	69	52	2818.00623	51.4013
14	1.52	181	75	50	2945.240625	74.8389
15	3.14	388	94	124	9154.59326	666.586

Table 4b

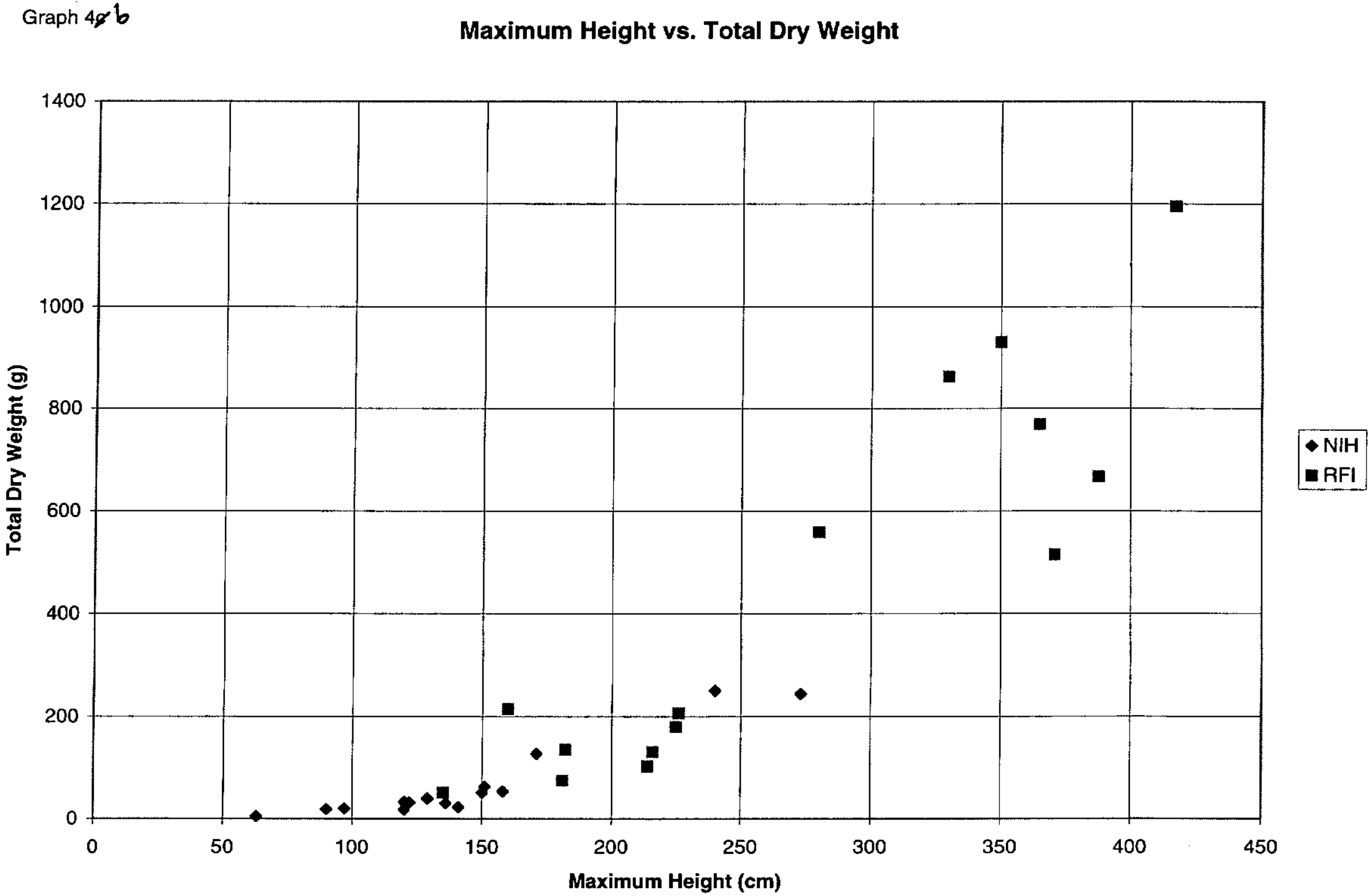
Alder Variables (ln)

ln Basal Diameter	ln Max. Height	ln Canopy Area	Total Dry Wght.
-0.105360516	4.574710979	6.315213036	20.06471595
0.139761942	5.062595033	6.909920144	53.73096774
0	4.804021045	6.814609964	32.12114437
0.2390169	4.859812404	6.72822535	40.13504065
-0.653926467	4.143134726	4.006929922	4.929019074
0.270027137	5.010635294	7.532449757	51.35295337
0.604315967	5.141663557	8.396074025	127.4737578
0.392042088	5.017279837	7.578874195	63.21443583
-0.186329578	4.787491743	5.923852534	17.96914447
-0.010050336	4.787491743	7.253976624	33.05904153
-0.030459207	4.94875989	5.644538712	23.09797576
0.751416089	5.480638923	8.129445361	250.1213391
0.693147181	5.609471795	7.686480281	244.0642473
-0.094310679	4.912654886	5.09597276	30.75388478
-0.116533816	4.49980967	7.061604731	18.81671379
1.223775432	5.857933154	9.487568845	930.8849735
1.223775432	5.899897354	9.317317013	768.3160037
0.678033543	5.416100402	8.609811778	179.0355885
1.252762968	6.033086222	9.50175348	1194.789017
0.425267735	5.365976015	7.947123805	103.0468049
1.406096988	5.799092654	8.648432037	862.8420274
1.098612289	5.916202063	7.981525231	515.1337316
0.530628251	5.375278408	8.050732787	130.872
1.111857515	5.634789603	9.210151372	559.1735048
0.593326845	5.204006687	7.772770417	135.2333959
0.678033543	5.420534999	8.1477945	206.5314983
0.770108222	5.075173815	8.551136143	214.572671
0.431782416	4.905274778	7.943784903	51.40131234
0.418710335	5.198497031	7.987945799	74.83894676
1.1442228	5.96100534	9.122011028	666.586413

Graph 4~~b~~a

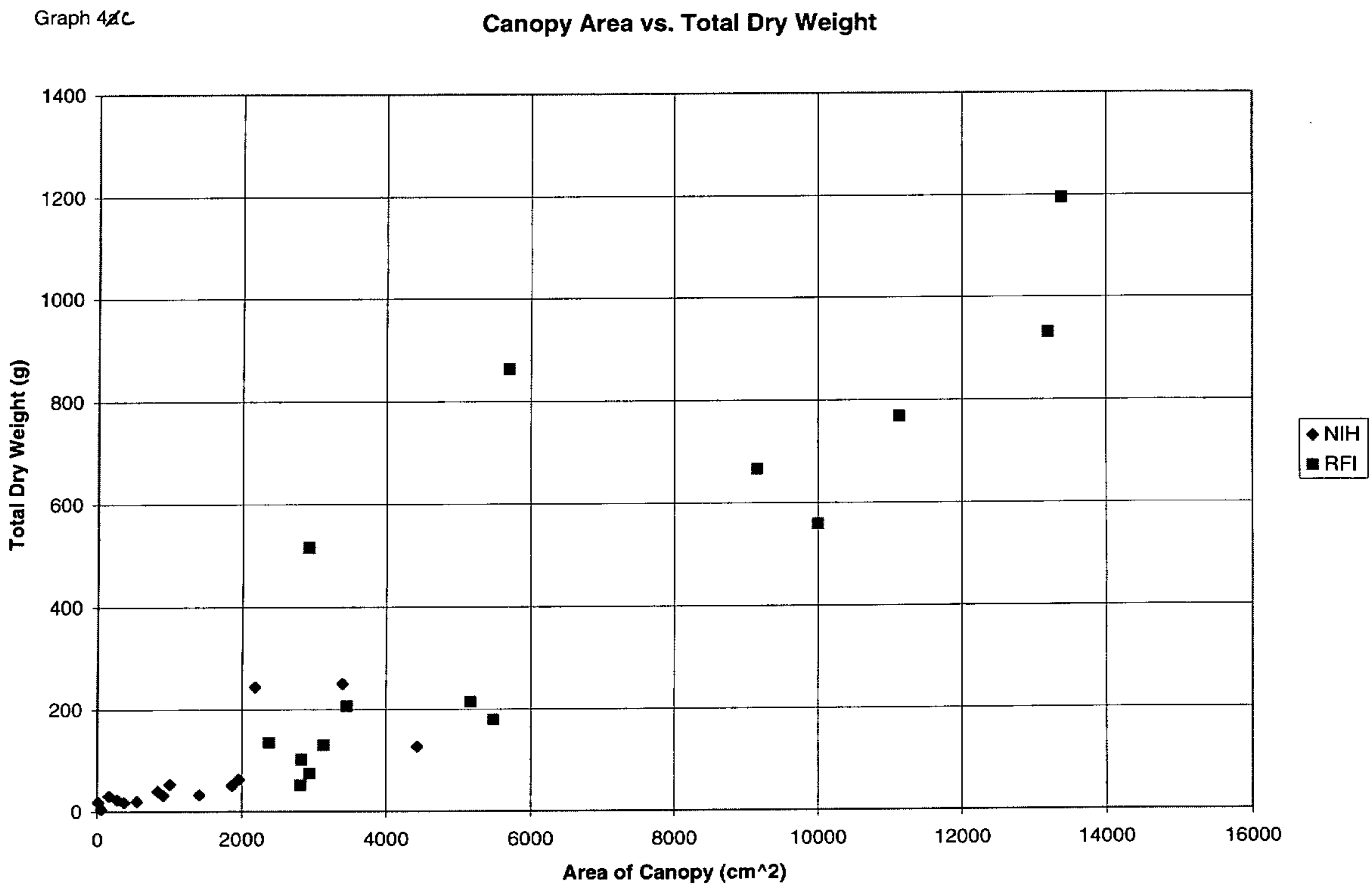

Basal Diameter vs. Total Dry Weight
Total Dry Weight (g)
0
200
400
600
800
1000
1200
1400
Basal Diameter (cm)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
NIH
RFI

Graph 4b



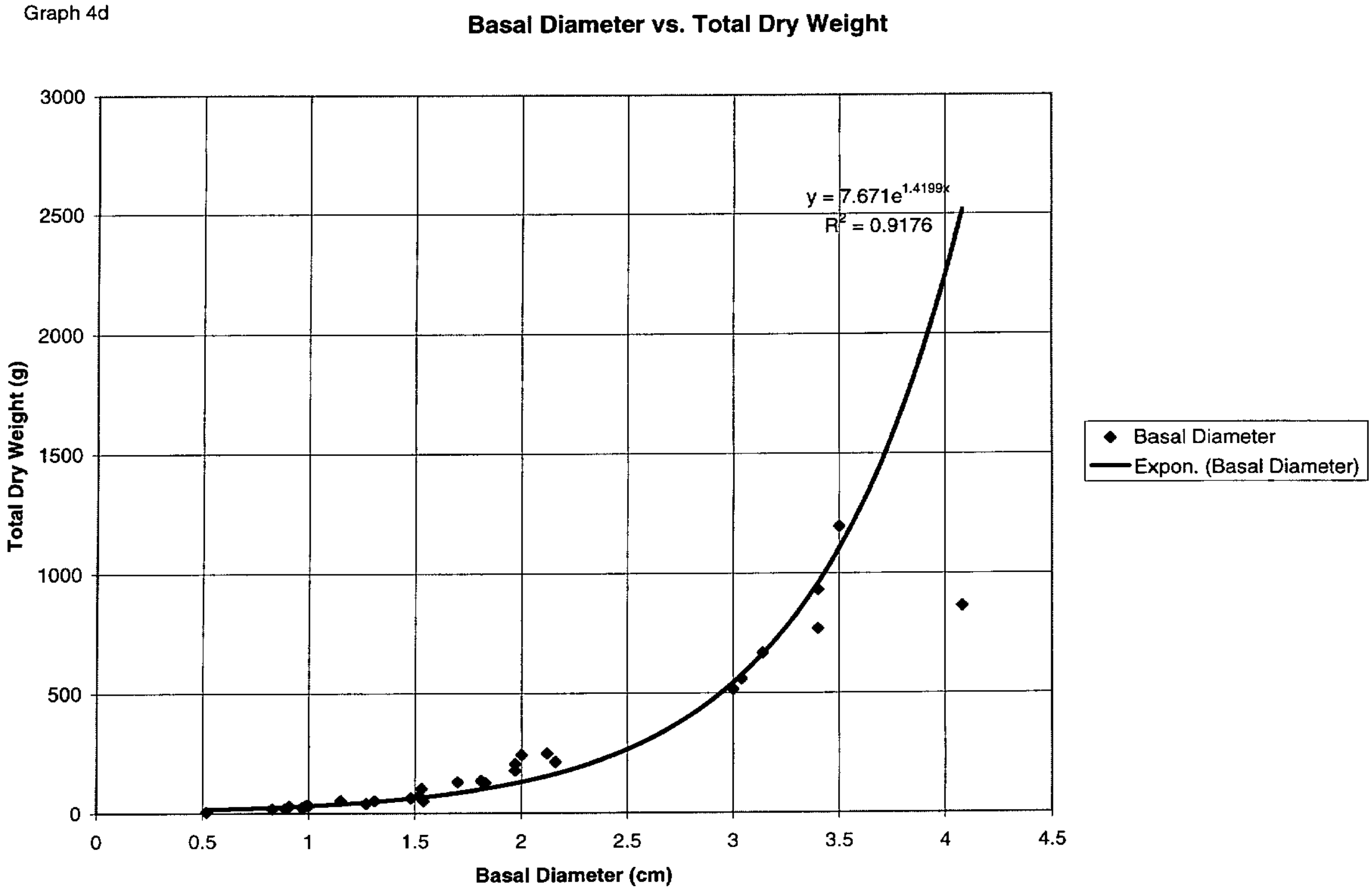
Maximum Height vs. Total Dry Weight
Total Dry Weight (g)
1400
1200
1000
800
600
400
200
0
0
50
100
150
200
250
300
350
400
450
Maximum Height (cm)
NIH
RFI

Graph 4C



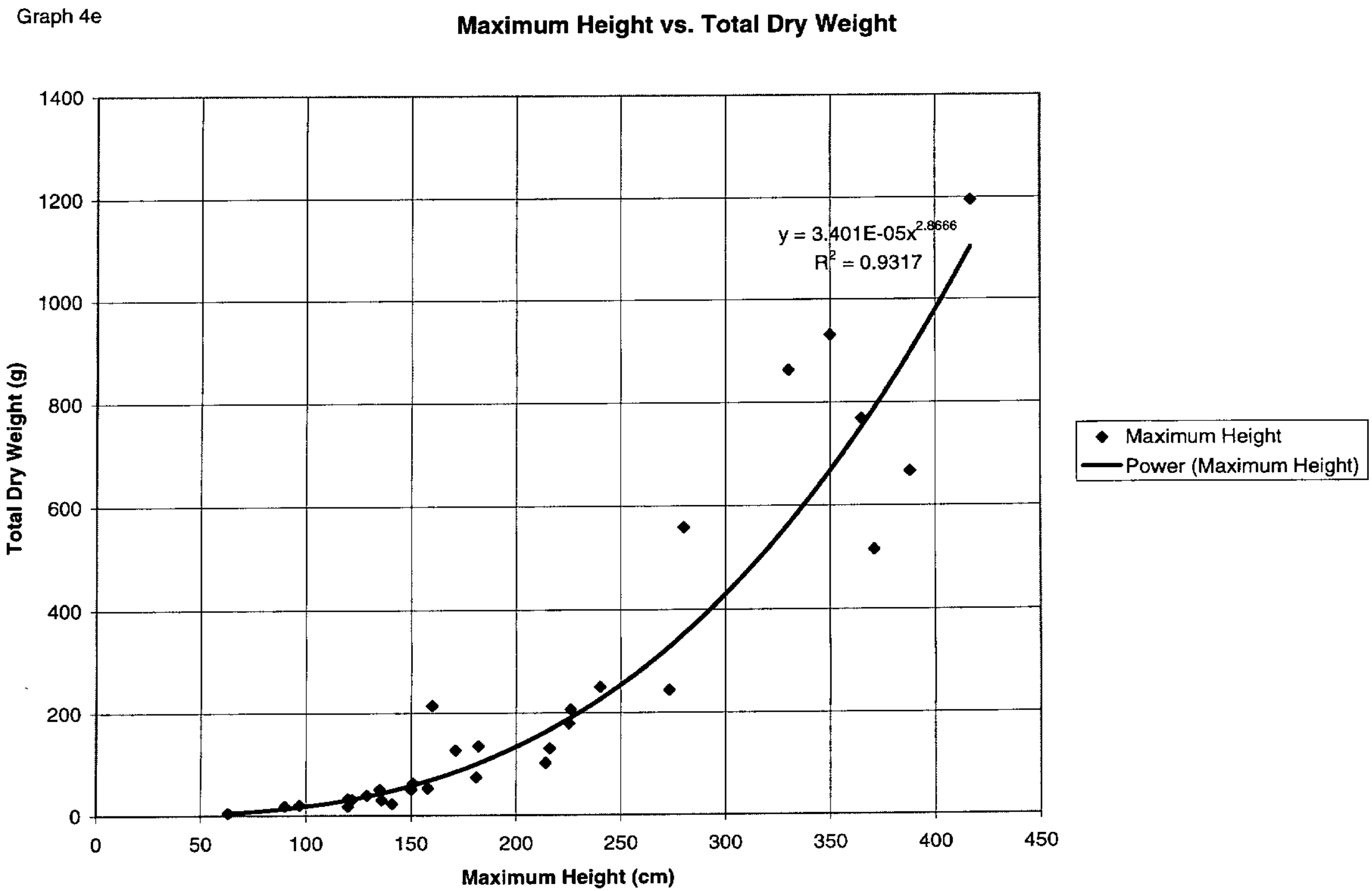
Canopy Area vs. Total Dry Weight
Total Dry Weight (g)
1400
1200
1000
800
600
400
200
0
0
2000
4000
6000
8000
10000
12000
14000
16000
Area of Canopy (cm^2)
NIH
RFI

Graph 4d



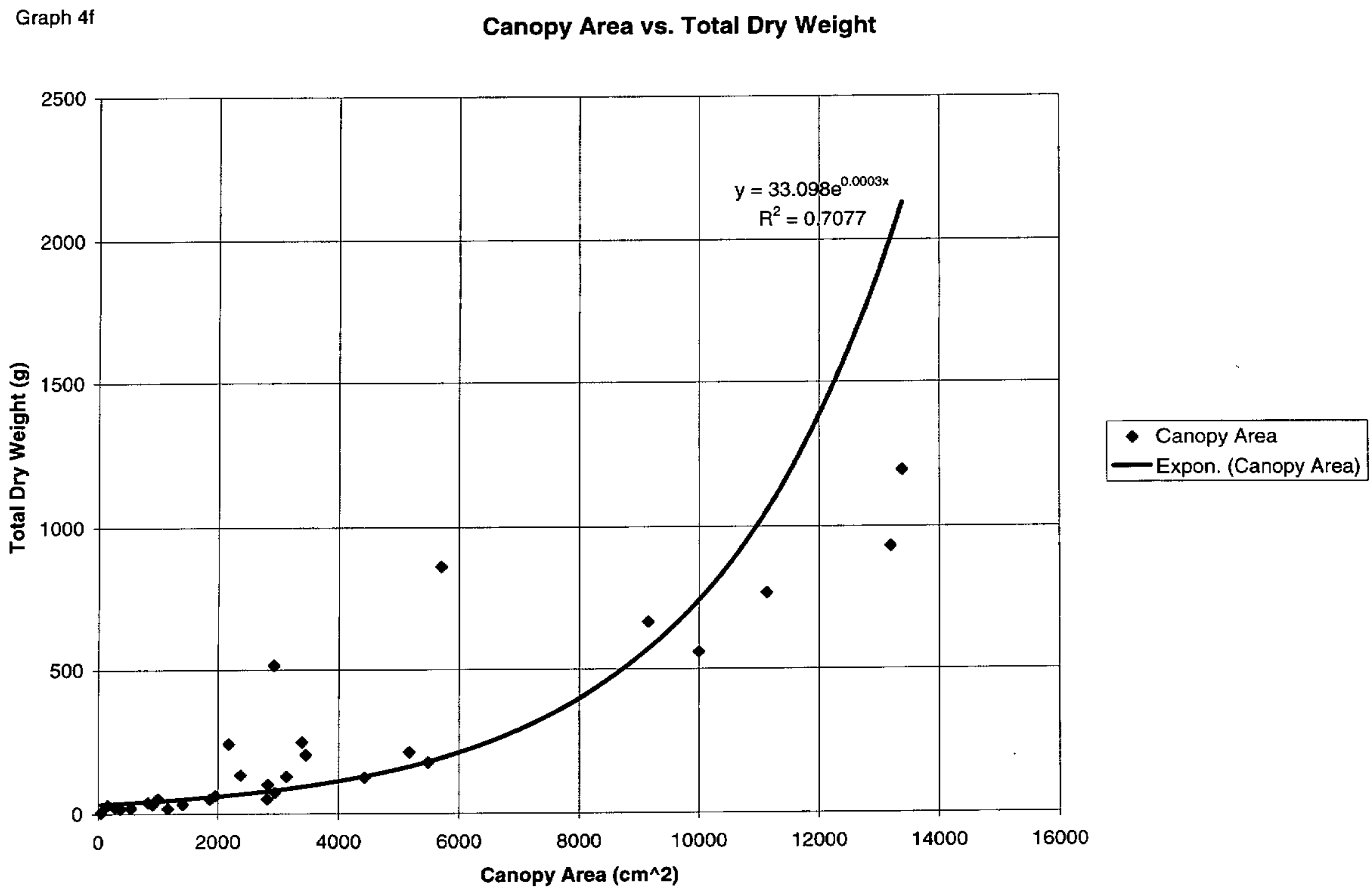
Basal Diameter vs. Total Dry Weight
y = 7.671e^1.4199x
R^2 = 0.9176
Total Dry Weight (g)
3000
2500
2000
1500
1000
500
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Basal Diameter (cm)
Basal Diameter
Expon. (Basal Diameter)

Graph 4e

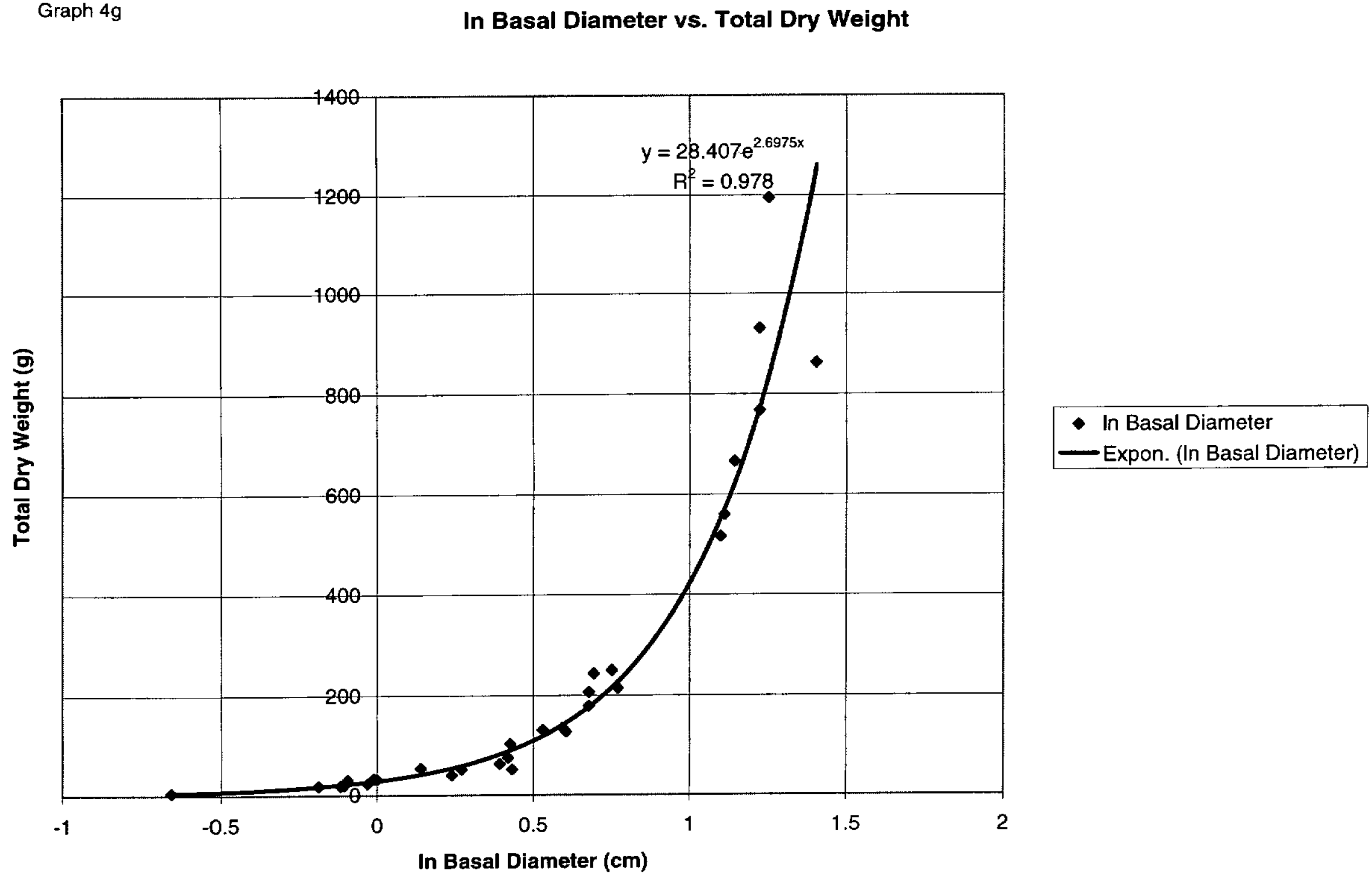


Maximum Height vs. Total Dry Weight
Total Dry Weight (g)
1400
1200
1000
800
600
400
200
0
0
50
100
150
200
250
300
350
400
450
Maximum Height (cm)
y = 3.401E-05x^2.8666
R^2 = 0.9317
Maximum Height
Power (Maximum Height)

Graph 4f

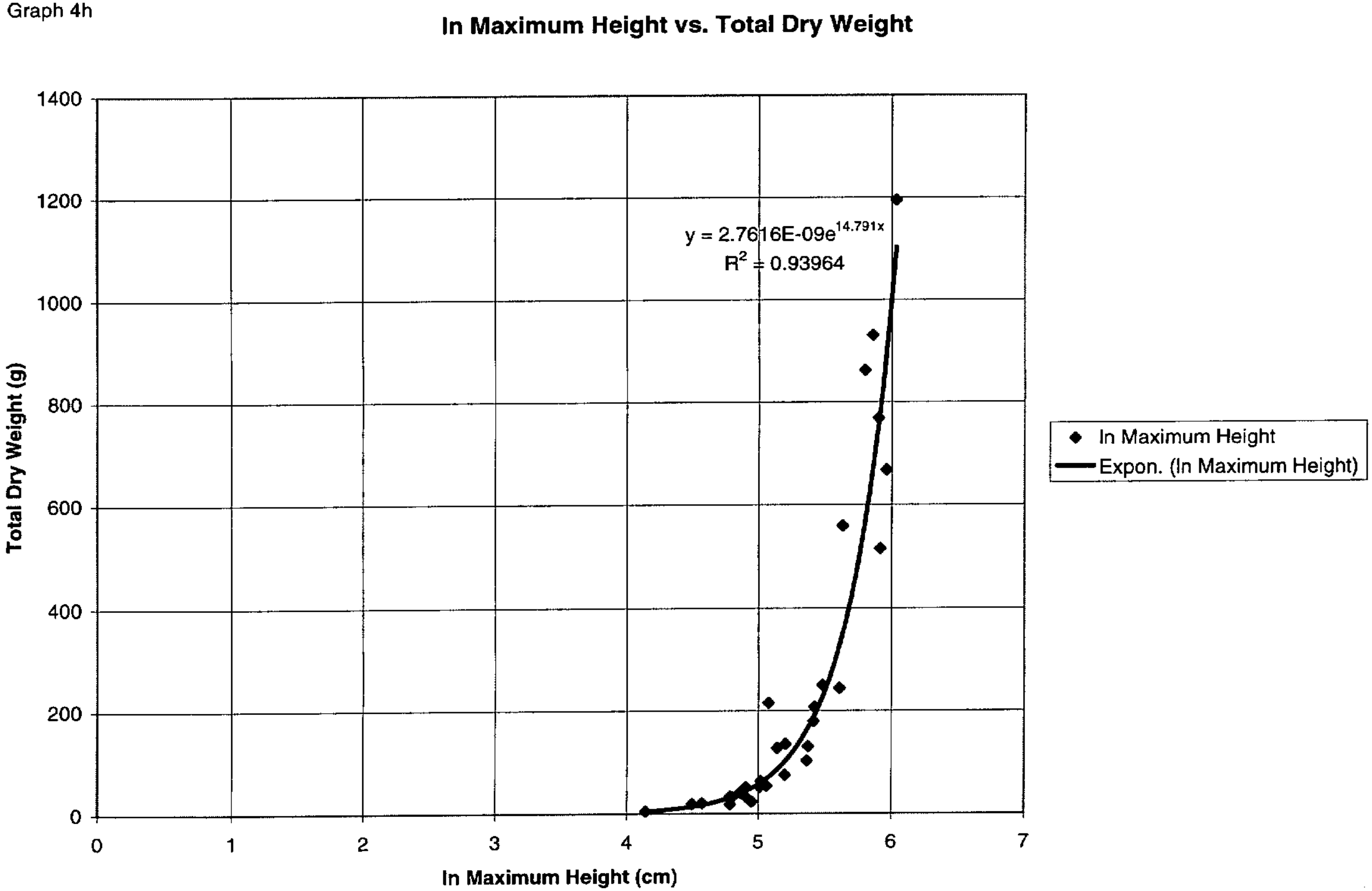

Canopy Area vs. Total Dry Weight
Total Dry Weight (g)
2500
2000
1500
1000
500
0
0
2000
4000
6000
8000
10000
12000
14000
16000
Canopy Area (cm^2)
y = 33.098e^0.0003x
R^2 = 0.7077
Canopy Area
Expon. (Canopy Area)

Graph 4g



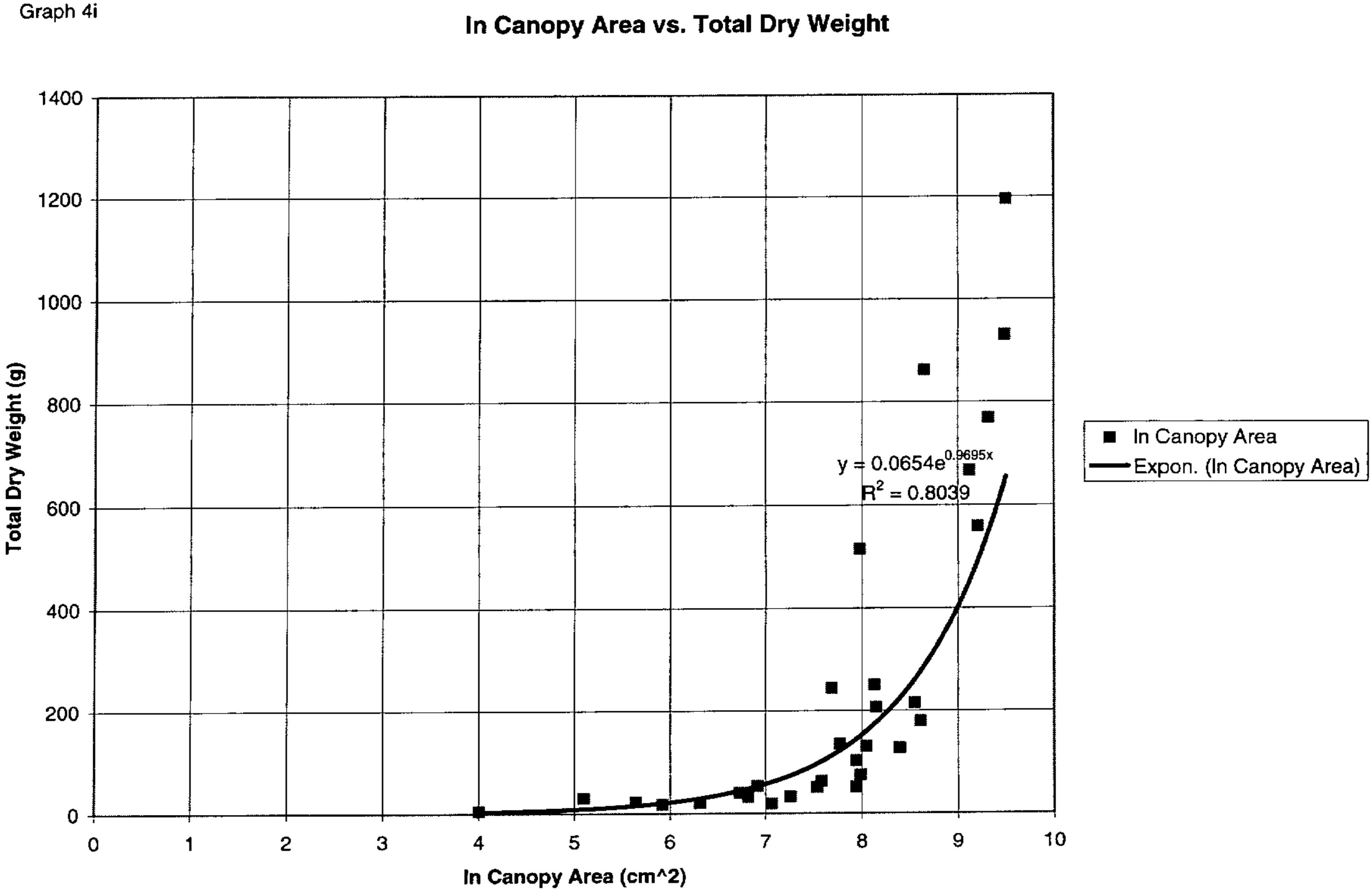
ln Basal Diameter vs. Total Dry Weight
y = 28.407e^2.6975x
R^2 = 0.978
Total Dry Weight (g)
1400
1200
1000
800
600
400
200
0
-1
-0.5
0
0.5
1
1.5
2
ln Basal Diameter (cm)
ln Basal Diameter
Expon. (ln Basal Diameter)

Graph 4h



ln Maximum Height vs. Total Dry Weight
y = 2.7616E-09e^14.791x
R^2 = 0.93964
Total Dry Weight (g)
1400
1200
1000
800
600
400
200
0
1
2
3
4
5
6
7
ln Maximum Height (cm)
ln Maximum Height
Expon. (ln Maximum Height)

Graph 4i



ln Canopy Area vs. Total Dry Weight
Total Dry Weight (g)
1400
1200
1000
800
600
400
200
0
0
1
2
3
4
5
6
7
8
9
10
ln Canopy Area (cm^2)
y = 0.0654e^0.9695x
R^2 = 0.8039
ln Canopy Area
Expon. (ln Canopy Area)

TABLE 4C

DEP VAR: DRYWGHT N: 30 MULTIPLE R: 0.958 SQUARED MULTIPLE R: 0.917
ADJUSTED SQUARED MULTIPLE R: 0.908 STANDARD ERROR OF ESTIMATE: 98.4378512

VARIABLE	COEFFICIENT	STD ERROR	STD COEF	TOLERANCE	T	P(2 TAIL)
CONSTANT	-278.7725612	50.0461603	0.0000000	.	-5.57031	0.00001
BASALDIA	127.4756493	58.9593012	0.3752623	0.1053586	2.16210	0.03999
MAXHGT	0.8471572	0.5212042	0.2561078	0.1278372	1.62538	0.11614
ELLIPSE	0.0313638	0.0093921	0.3700678	0.2584422	3.33940	0.00254

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
REGRESSION	.280111E+07	3	.933703E+06	96.3572973	0.0000000
RESIDUAL	.251940E+06	26	.969001E+04		

DEP VAR: DRYWGHT N: 30 MULTIPLE R: 0.861 SQUARED MULTIPLE R: 0.741
ADJUSTED SQUARED MULTIPLE R: 0.711 STANDARD ERROR OF ESTIMATE: 174.5344809

VARIABLE	COEFFICIENT	STD ERROR	STD COEF	TOLERANCE	T	P(2 TAIL)
CONSTANT	-192.9522075	.117482E+04	0.0000000	.	-0.16424	0.87081
LBASAL	585.7525514	263.4189653	0.9370474	0.0561875	2.22365	0.03507
LMAXHGT	150.9703923	211.0602594	0.2218216	0.1037508	0.71530	0.48080
LELLIPSE	-82.7555082	61.0066164	-0.3339651	0.1646138	-1.35650	0.18660

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
REGRESSION	.226103E+07	3	.753677E+06	24.7413104	0.0000001
RESIDUAL	.792019E+06	26	.304623E+05		

TABLE 4D

PEARSON CORRELATION MATRIX

	BASALDIA	MAXHGT	ELLIPSE	DRYWGHT	LBASAL
BASALDIA	1.0000000				
MAXHGT	0.9326781	1.0000000			
ELLIPSE	0.8584635	0.8251299	1.0000000		
DRYWGHT	0.9318182	0.9114607	0.9035390	1.0000000	
LBASAL	0.9667023	0.9131335	0.8234242	0.8429536	1.0000000
LMAXHGT	0.9110397	0.9706150	0.7798715	0.8309325	0.9431986
LELLIPSE	0.8233393	0.7649960	0.8136513	0.6995500	0.9082256

	LMAXHGT	LELLIPSE
LMAXHGT	1.0000000	
LELLIPSE	0.8225738	1.0000000

BARTLETT CHI-SQUARE STATISTIC: 429.722 DF= 21 PROB= 0.000

MATRIX OF PROBABILITIES

	BASALDIA	MAXHGT	ELLIPSE	DRYWGHT	LBASAL
BASALDIA	0.0000000				
MAXHGT	0.0000000	0.0000000			
ELLIPSE	0.0000000	0.0000000	0.0000000		
DRYWGHT	0.0000000	0.0000000	0.0000000	0.0000000	
LBASAL	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
LMAXHGT	0.0000000	0.0000000	0.0000004	0.0000000	0.0000000
LELLIPSE	0.0000000	0.0000009	0.0000000	0.0000169	0.0000000

	LMAXHGT	LELLIPSE
LMAXHGT	0.0000000	
LELLIPSE	0.0000000	0.0000000

NUMBER OF OBSERVATIONS: 30

relationship between the total dry weight and physical dimensions. Results of the multiple regression (see table 4c) reveal a correlation coefficient (R^2) of 0.917 for the relationship between total dry weight and the physical dimensions, while a correlation coefficient of 0.741 results for a multiple regression of the total dry weight against the natural logs of the three measured physical dimensions. Also found in this study was the P values of the relationships being studied. The P value for the relationship between basal diameter and total dry weight is 0.040, the P value for the relationship between maximum height and total dry weight is 0.116, and the P value for the relationship between the canopy area and the total dry weight is 0.003. The P value for the relationship between the log of basal diameter and total dry weight is 0.035, the P value for the relationship between the log of the maximum height and total dry weight is 0.481, and the P value for the log of the canopy area and the total dry weight is 0.187.

Lastly, we tested the correlation between the three types of physical dimensions measured; results of this statistical analysis are revealed in table 4d. The results show that basal stem diameter and maximum height have a correlation of 0.933, while basal diameter and canopy area (ellipse) have a correlation of 0.858, and maximum height and canopy area have a correlation of 0.825. The natural log of basal stem diameter and the log of maximum height have a correlation of 0.943, the natural log of basal stem diameter and the log of canopy area have a correlation of 0.908, and the natural log of maximum height and the natural log of canopy area have a correlation of 0.823.

Discussion

Peat Characteristics

Peatlands are classified according to different characteristics by different scientists. In this study, we concentrate on how peatlands are characterized and classified according to peat conditions. Bridgham (et al. 1996) states that accumulation of soil organic matter is the primary defining characteristic of peatland classification; we can include decomposition and other conditions we studied as indicators of peatland characteristics and underlying mechanisms as well. It is emphasized that peat characteristics are controlled by decay, not production. Accumulation of peat thus exerts and important control of underlying mechanisms and environmental characteristics, namely hydrology, biogeochemistry, and plant community composition of a peatland, as outlined by Bridgham. According to this type of classification, we expect that there will be differences between the bogs' peat characteristics and the those of the alder and cedar areas and that we will be able to see these differences in our study. Although we did not study hydrology and biogeochemistry, our data may be able to support some conclusions about why we saw differences between and among the three areas studied.

The peat conditions in site I are quite variable in that each nest often shows its own trends as depth increases, yet groupings along the spectrum and similar movements that emerge among and between the nests may show some correlations between conditions observed at the nests. The groupings which emerge from the data for site I may reveal a tendency for soil conditions to be similar at sites near extreme environment changes and/or far from such changes. Nests IA and IC group together toward the same end of the spectrum--these two nests are right at borders of environment / condition changes. Nest IA, in the alder area, is about 3 meters from a stream while nest IC is about 2 meters from the border between the alder area and the cedar swamp. Often these two nests move oppositely of each other; this could be due to the difference in their environments. Nest ID often groups with these two nests; why this occurs is not quite known since this nest is well within the boundaries of the cedar swamp. Nests IB and IE in site I move very similarly to each other and they generally group together at one end of the spectrum relative to the other three nests. These tendencies may occur because they are relatively far from abrupt environmental changes: nest IB is about 30 meters in from the stream and about 10 meters from the border between the alder area and the cedar swamp, while nest IE is the nest farthest into the cedar swamp, far from the border between the alder area and the cedar swamp. The groupings emerging in this site could be due to differences in the way in which peat responds and changes with reference to decay rates and organic quality along environmental interfaces.

Again, grouping and similar movement tendencies occur with the nests in site II. We have seen that nests IIA, IIB, and sometimes IIC often move similarly which could be due to their position nearest the stream. As depth continues to decrease past the depths at which IIA and IIB end, nest IIC joins nests IID and IIE to reveal similar conditions as depth increases through maximum depths at all three nests. This shows that at intermediate and maximum depths, the bog's peat is fairly similar in content as one progresses outward from the stream. Groupings along the spectrum do occur at this site: IIA and IIB are generally at one end of the spectrum while nests IIC, IID, and IIE group at the other end — these groupings are not located far from one another along the spectrum, yet there is an observable separation between these two groups. This could show a difference between the type of peat at shallow depths. It is important to note what causes the sharp differences at maximum depths of IIC, IID, and IIE: this is most likely due the collection of cores into the mineral surface. Thus, peat is no longer being studied and this information is of no use in this study.

When analyzing the difference between the three areas, we see that there are some trends. The alders and cedars move opposite of each other for most of the conditions studied. This could show a difference in the peat type. Specifically, peat in the alders area increase in moisture as depth increases an effect which causes the D/W to decrease as depth increases. The peat in the alder area ends up less dense than in the cedars at maximum depths--this could be due to the increased %RF, ie. larger (less decomposed) pieces of organic material cause density to decrease because there is more space between particles. This decrease in decomposition would account for the increased %OC because if material decays less, it retains a greater percentage of its organic matter and thus organic carbon. The overall increase of %RF could account for the greater percentage of moisture retained by this area because larger and less decayed material would be able to hold moisture better than more decomposed material.

Fairly opposing trends are seen for the cedar area. Notably, the %RF decreases overall and thus %M decreases and BULK increases. As would be expected from the decreasing trend in %M, D/W increases overall with depth. The %OC trend for the cedars is not clear due to the great fluctuations, so no conclusions may be drawn; however, if further studies were conducted and better results obtained, it would be expected that %OC would decrease because %RF decreased.

The conditions in the bog site are variable. Percent organic carbon decreases regularly with depth, so it is expected that %RF would decrease along with it, yet %RF does not decrease cleanly — there is an increase in the upper intermediate levels. Additionally, BULK and D/W do not correlate with %M because %M increases then decreases as depth increases and we would expect similar changes with D/W and BULK. Rather, both D/W and BULK are rather constant as depth increases, a trend that does not correlate with %M. The trends seen in site II are not as easily explainable as those in site I areas.

Bridgham (et al. 1996) notes that bogs show lower decay rates than fens (Verhoeven et al. 1990, cf. Bridgham et al. 1991). Though fens are not directly studied here, we may extrapolate this to include other minerotrophic environments, in which the alder area and cedar swamp are included. If bogs have a higher decay rate, its percentage of rubbed fiber will be lower and its percentage of organic carbon will be lower relative to the other two sites studied. In his 1996 paper, Bridgham states that the carbon quality, which we express as percent organic carbon, of peat is an important constraint on the rate of decay (Valentine et al. 1994, Bridgham et al. 1995a, Updegraff et al. 1995). Indeed, our study supports these statements by Bridgham. The carbon quality in the bog is greater than that in the alders and cedars and thus the %RF is greater as well. This may explain the differences seen between the bog and the site I areas relating to %M, BULK, and D/W because if %OC is greater and %RF is greater, then %M will be greater while D/W and BULK will be lower, which are in fact the trends observed.

As noted, there is a clear distinction between the trends associated with the conditions in site I and those of site II; this simply confirms the observance that the sites were different environments and thus contained different peat characteristics. After all, peatlands are characterized according to these conditions. Site II is a bog characterized by *Sphagna*, conifers, low alkalinity (casually measured); along with these characteristics, it is inferred that the bog will be ombrotrophic and exhibiting a high percentage of organic carbon (related to a low decay rate.) Indeed, we have observed these characteristics in this study and thus we illustrate correlation between these characteristics to support the expectations that a bog exhibiting these characteristics will contain peat supporting the exhibited characteristics. The same holds true for the alder area and the cedar swamp: both are more mineral-rich than the bog and so their peat is distinguished from the bog peat according to expectations and supported by our data. Each area differs from the other due to the type of environment; namely, the peat in alder area become richer in organic carbon with depth (thus a lower decay rate) as opposed to the peat in the cedar swamp becoming depleted in organic carbon with depth (thus a higher decay rate) perhaps relating to the differences observed and supported in the two areas, which would be related to the underlying mechanics in the areas. Though we did not delve into the mechanics underlying the issue, we can assume the mechanics differ between these three areas, thus causing the differences observed in peat conditions within and throughout the sites and expressed by plant matter and soil terms in the peatland types.

Alder Allometrics

This study on alder allometrics has attempted to relate the biomass of the speckled alder to its dimensionality so that the biomass can be found in the field in a non-destructive manner given the measurements of the physical dimensions outlined in this study. We have been successful in determining that there is indeed a strong relationship between these dimensions and the biomass — specific relationships are detailed above in the results section. We see there are strong correlation coefficients for the basal diameter and maximum height relationships with biomass (both the standard measurements and the log of these measurements) and there are weaker correlation coefficients for the two studies with the canopy area; thus, we may conclude that the former relationships are more predictable and stable than the relationship of canopy area with biomass.

The statistical analyses further support our findings. The correlation coefficient for all three standard physical measurements is higher than the correlation coefficient for the natural logs of the physical measurements; therefore, we may infer that these have stronger relationships to biomass, taken together. The P values indicate that there is a strong relationship between each physical dimension measured and biomass because the results are correlated so well that chance is only slightly responsible for results seen. We have found that maximum height and basal diameter are most reliable and are closely correlated with each other; this is true for both the standard measurements and the log of the measurements. Canopy area does provide a reasonable relationship, but is not conclusive. If stronger relationships are needed, it may be helpful to continue this study to include more replicates in order to find more consistent relationships, especially relating to canopy area relative to biomass.

Acknowledgment

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