

APPENDIX 2

PALYNOLOGY OF TWO CORES FROM ARCHEOLOGICAL SITE 7K-C-107, KENT COUNTY, DELAWARE Final Report Grace S. Brush

Palynological investigations were carried out for 2 sediment cores collected at Archeological Site 7K-C-107 in Kent County, Delaware by J. Pizzuto and W. Daniels. The palynological investigations were done to provide information on vegetation changes at the site that could be used in developing the Quaternary geomorphologic history of the site. The location of the cores is shown in Fig. 1 (Daniels 1993), and the stratigraphy in Fig. 2 (Daniels, 1993). Table 1 gives the depth, description and ^{14}C dates of the cores, summarized from Daniels 1993.

Table 1. Description and dates of Core PC-14

Depth (cm)	Date (ybp)	Description
0-24		clayey silt with organic debris; 10YR2/2; a trace of fine grained sand and roots
24-45		sandy to clayey silt to peat with abundant wood and leaf debris ;5YR2/1
45-64	40-50 cm: 1410±70	silty sand, fine to medium grained, with abundant fine organic debris; 10YR4/2; abundant leafy debris and large wood fragments
64-88		slightly sandy peat, mostly leafy debris; abundant wood fragments; 10YR2/2
88-92	81-91 cm: 2070±60	Sand, fine to medium grained, with a trace of organic debris; 5Y7/2
92-174	120-130 cm: 10450±100 169-177 cm: 10470±90	clayey to silty sand, fine grained with very fine organic debris; 5YR4/1
174-190		silty sand, fine to medium grained, with very fine organic debris 5YR4/1 to 10YR2/2
190-204		sand, medium to coarse grained; 5Y7/2
204-213		clayey to silty sand, fine-grained with trace of fine organic debris; 10YR4/2
213-256		sand, fine to medium grained; 5Y7/2
256-263	257-262 cm 11420±350	clayey to silty sand, fine grained with trace of fine organic debris; 5Y5/2; traces of leaf and wood debris
263-278		sand, medium to coarse grained with coarse sand and granules; 5Y7/2
278-304		sand, coarse to very coarse grained, with abundant granules and pebbles; 5Y7/2
304-316		silty sand, fine to medium grained, with occasional coarse sand; 10YR5/4
316-352		clayey silt with very fine organic debris; 10YR2/2

Core Pc-17

0-10		clayey silt with fine organic debris; occasional roots; 10YR2/2
10-66		silty clay with abundant fine organic debris with some roots and leaf debris; 10YR2/2 & 5YR2/1
66-103	70-75cm: 5680±80	silty clay to peat with abundant fine organic debris with trace fine grained sand 5YR2/1
103-124		clayey silt with trace fine organic debris; fine grained sand and leafy organic debris; 5Y5/2
124-140		sand, fine-grained with trace roots and some organic debris; 10YR2/2
140-208		sand, fine to medium grained, with occasional thin layers of clayey silt to sand; 10YR2/2
208-240		sand, medium to very coarse grained; 5Y7/2
240-267		sand, medium to coarse grained with occasional coarse sand & granules; 5Y3/2
267-292		clayey silt with trace fine organic debris; 10YR2/2

Each sediment core was subsampled into 1 cm intervals and stored in labelled ziploc bags at 4°C. 1.5 ml of sediment was removed from selected subsamples, weighed and treated with hydrochloric and hydrofluoric acid. The sample was then acetylyzed by boiling for 2 minutes in a mixture of sulfuric acid and acetic anhydride. The residue was washed in glacial acetic acid, water, and ethanol. The entire residue of each sample is stored in 25 ml tertiary butyl alcohol. An aliquot of 0.1 ml of the treated sample was mounted in silicone oil on a microscope slide, and all of the pollen identified and counted on a slide.

The pollen identified in the cores is listed in Table 2.

Table 2. Pollen taxa identified in Cores PC14 and PC17;

Conifers:

<i>Juniperus</i>	red cedar
<i>Pinus</i>	pine
<i>Tsuga</i>	hemlock

Angiosperms (arboreal):

<i>Alnus</i>	alder
<i>Betula</i>	birch
<i>Carya</i>	hickory
<i>Castanea</i>	chestnut
<i>Celtis</i>	hackberry
<i>Corylus</i>	hazelnut
<i>Fagus</i>	beech
<i>Fraxinus</i>	ash
<i>Ilex</i>	holly
<i>Juglans</i>	walnut
<i>Liquidambar</i>	sweet gum
<i>Magnolia</i>	magnolia
<i>Morus</i>	mulberry
<i>Nyssa</i>	black gum
<i>Platanus</i>	sycamore
<i>Prunus</i>	cherry
<i>Quercus</i>	oak
<i>Robinia</i>	black locust
<i>Salix</i>	willow
<i>Tilia</i>	basswood
<i>Ulmus</i>	elm

(non-arboreal)

<i>Ambrosia</i>	ragweed
<i>Cephalanthos</i>	buttonbush
Cyperaceae	sedge family
Ericaceae	blueberry family
Gramineae	grass family
Leguminosae	legume family
Myricaceae	myrtle family
Nymphaeaceae	water lily family
<i>Plantago</i>	plantain
Polygonaceae	buckwheat family
<i>Sagittaria</i>	arrowhead
Saxifragaceae	saxifrage family
<i>Sparganium</i>	bur-reed
<i>Solidago</i>	goldenrod
<i>Stellaria</i>	chickweed
<i>Typha</i>	cattail
Umbelliferae	parsley family
<i>Viburnum</i>	arrowwood
<i>Vitis</i>	grape

Pteropsida

<i>Dryopteris</i>	wood fern
Filicineae	undifferentiated ferns
<i>Osmunda</i>	cinnamon fern
<i>Sphagnum</i>	sphagnum moss

Concentrations (numbers of pollen grains cm⁻³) and relative percentages of pollen taxa are plotted against depth (Figs. 2 - 5). Coniferous grains are indicated by horizontal lines in the silhouettes. Stippled silhouettes indicate 5x exaggeration.

CORE PC-14 (Figs. 2, 3)

The bottom part of this core is believed to be pre-Holocene (J. Pizzuto, personal communication). The pollen profile lends support to this interpretation. Sediments deposited prior to 11,000 years ago at the bottom of the core contain abundant pine, hickory and oak, which is not characteristic of early Holocene, but does resemble older interglacial profiles collected from the upper Chesapeake Bay area (Brush and Hughes, 1992).

Sediments deposited between 11,000 and 10,400 years contain very little pollen. Most layers have no pollen. Around 10,000 years ago, the pollen profile is dominated by pine, wood fern and some club moss. Sphagnum moss is also abundant. Hemlock and red cedar are present, along with birch, alder and maple. Included in the pine category are a few spruce and fir pollen (see Appendix). The pollen assemblage indicates that this portion of the core is early Holocene. This period is followed by hickory and walnut. Oak which occurs along with conifers continues from 10,000 years to the present. The hickory-walnut zone is accompanied by chestnut, holly, sycamore, black locust and elm. Several herbaceous forms, including members of the blueberry family, arrowhead, members of the parsley family, grasses, and arrowwood accompany hickory and walnut. This assemblage is representative of middle to more recent Holocene. Sedimentation rates appear to be very low during this time, so the resolution is low. and dry periods possibly indicated by hickory and wet periods by walnut. However the pollen indicates a drier period following early Holocene, characterized by increases in hickory, blueberry and goldenrod. Walnut which suggests wetter conditions as well as cattail appear to occur synchronously, but this may be due to the integration of wet and dry periods due to extremely low sedimentation. Very little pollen is contained in the core from 100 cm to the top 25 cm. The top part of the core above 25 cm from the surface contains abundant ragweed, indicating that this sediment has been deposited since European settlement. Oak, hickory, walnut, holly and elm are the most important tree taxa during recent time, and represent a Coastal Plain vegetation. Herbaceous pollen constitute an important part of the recent assemblage.

CORE PC-17 (Figs. 4, 5):

The pollen profile for Core PC-17 indicates that it contains some of early Holocene, as well as middle and recent Holocene sediments. Pollen concentrations are highly variable throughout the core, with the highest numbers between 100 and 125 cm. Included in the pine category are some fir and spruce grains at the bottom of the core (see Appendix). Moreover, pine pollen contains a wide range of sizes from very small ($<40\mu$ to 90μ), suggesting that there were several species of pine. The pine peak, which is accompanied by a peak in hemlock, correlates with a peak in wood fern and cinnamon fern and abundant sedges. This is followed by increases in hickory and holly, and among the herbaceous flora by members of the blueberry family and also by goldenrod, indicating drier conditions. Ragweed characterizes the sediments above 25 cm, indicating that this is post-European time. Some Coastal Plain deciduous tree pollen are present and a number of herbaceous types.

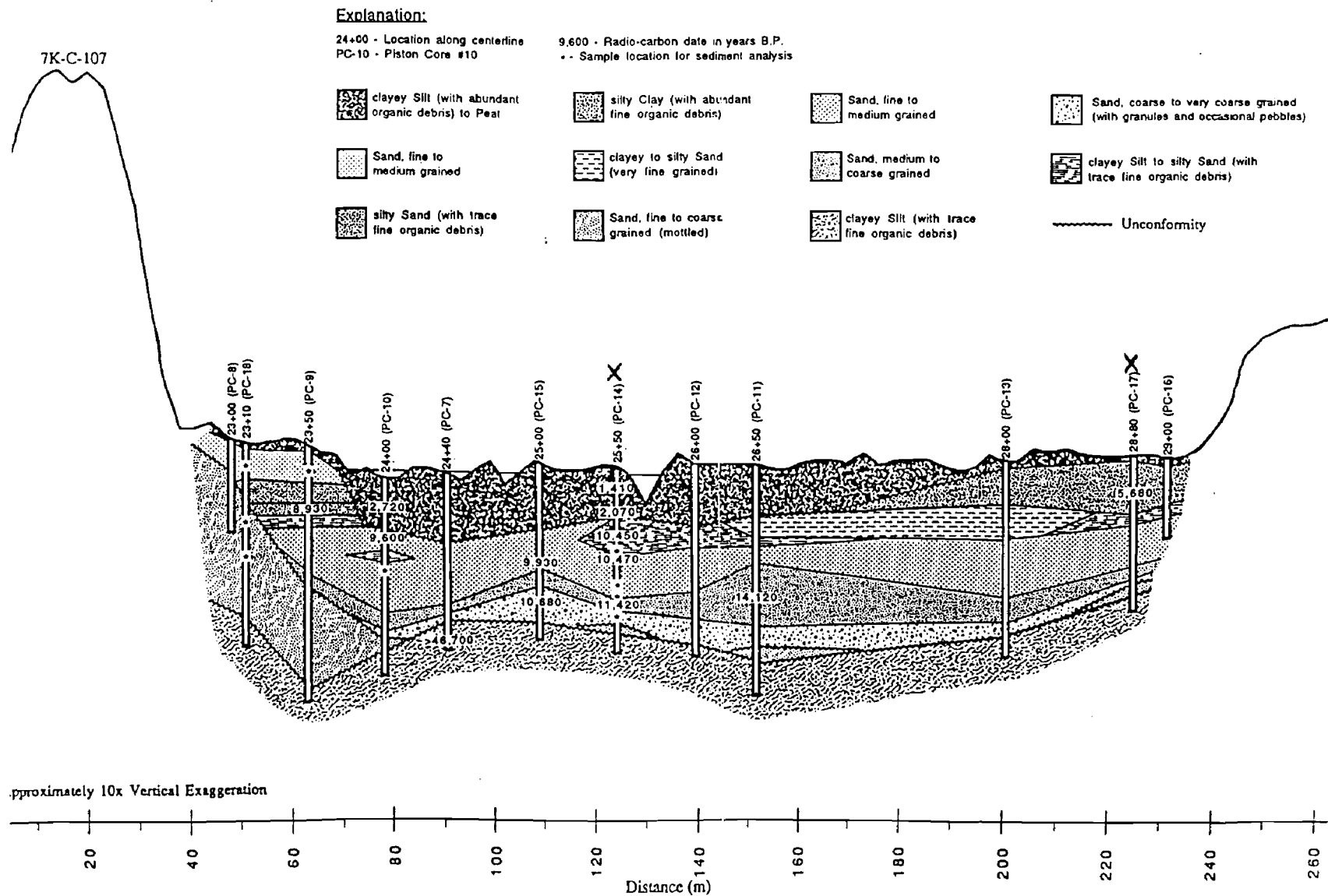
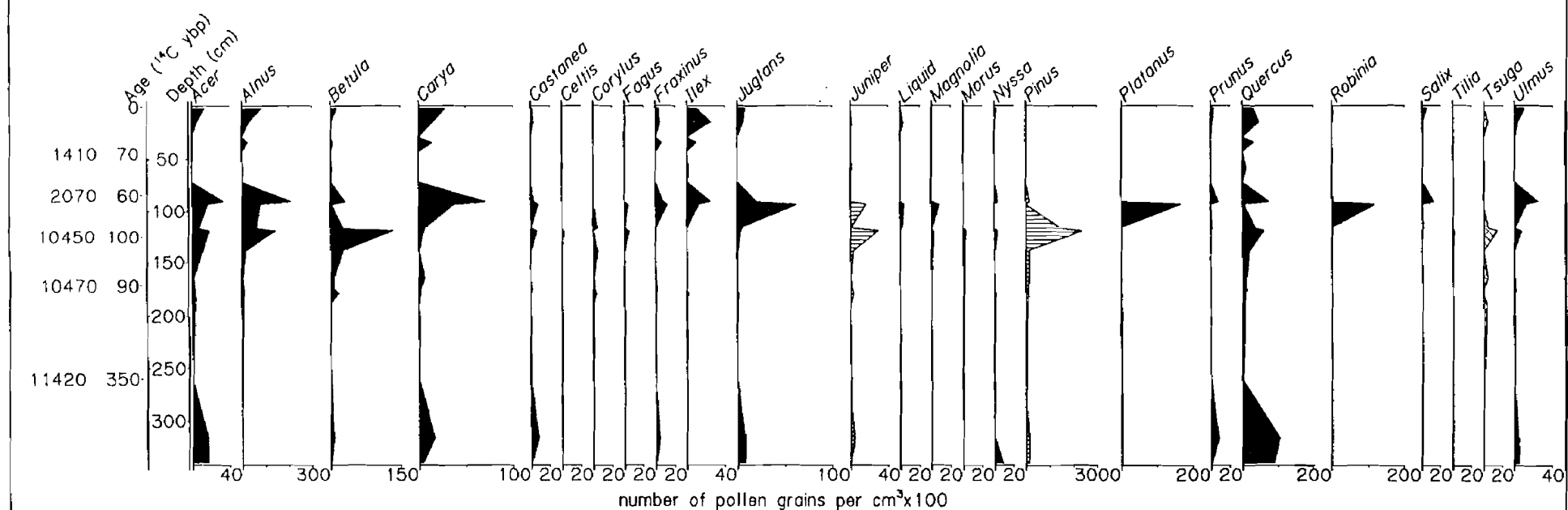


Figure 2. Generalized lithologic cross-section for the floodplain from 21+50 to 30+00, (from Daniels 1993).
X - cores analyzed for pollen.

DELAWARE CORE PC14 --ARBOREAL POLLEN CONCENTRATIONS



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DELAWARE CORE PC14 -- NON-ARBOREAL POLLEN CONCENTRATIONS

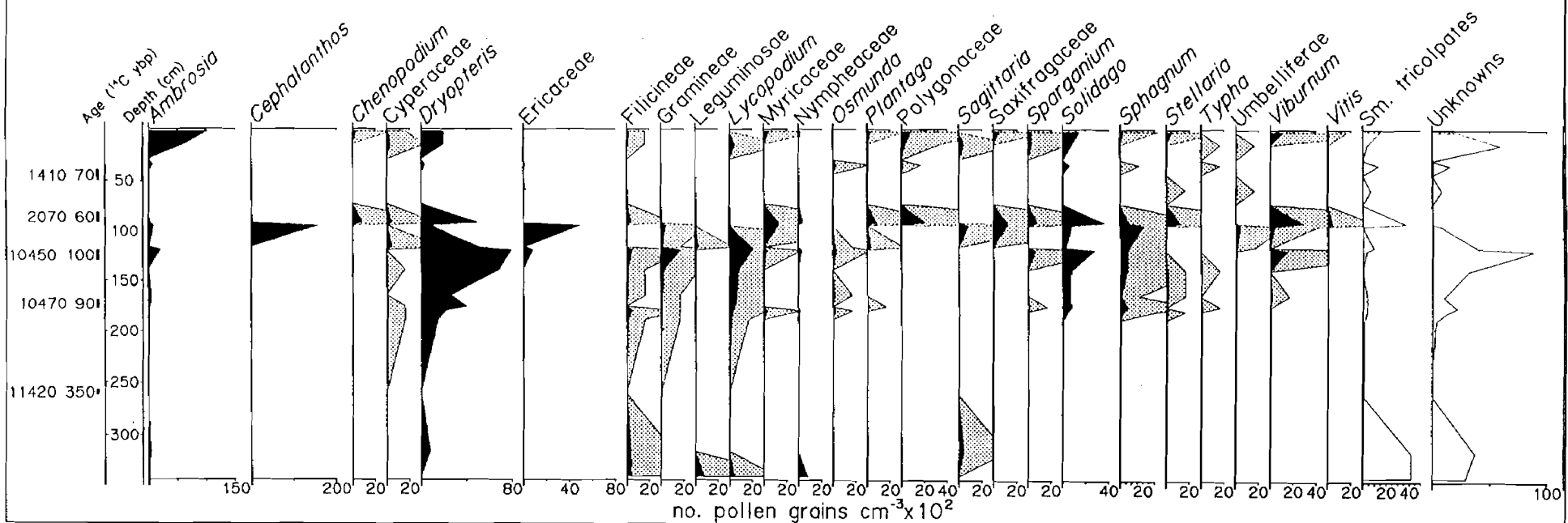
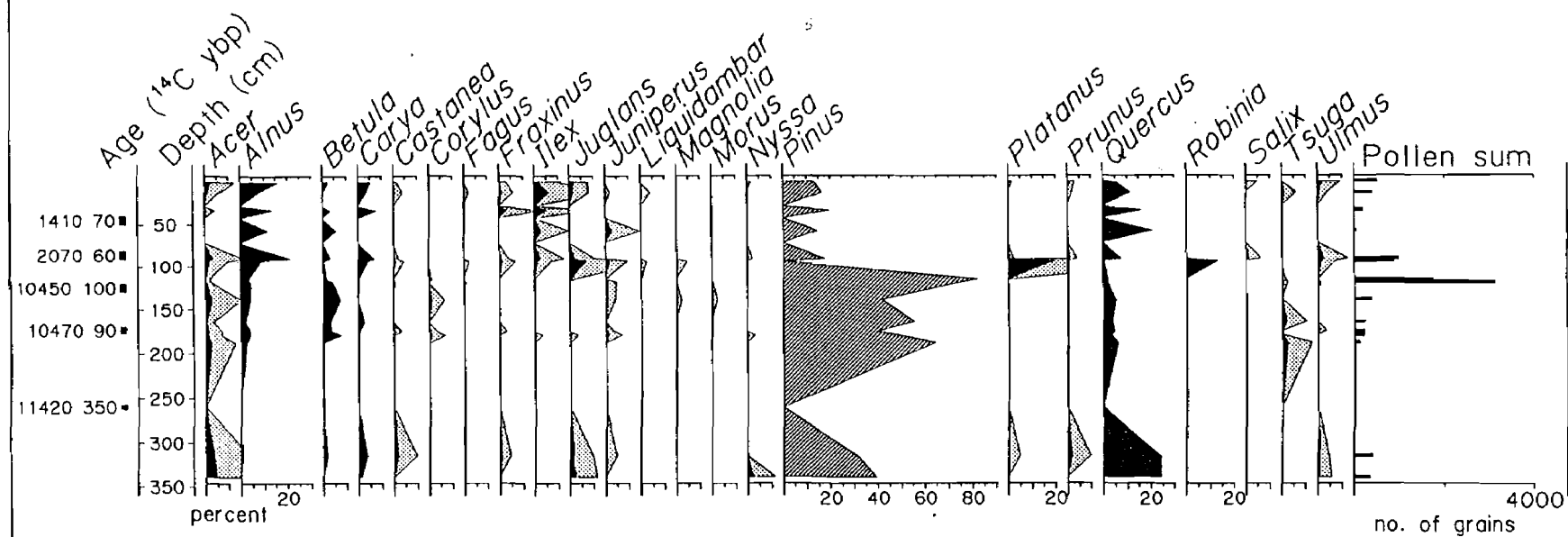


Figure 3. Pollen concentrations of Core PC-14. Stippled areas indicate 5X exaggeration.

DELAWARE CORE PC14 -- ARBOREAL POLLEN PERCENTAGES



DELAWARE CORE PC14 -- NON-ARBOREAL POLLEN PERCENTAGES

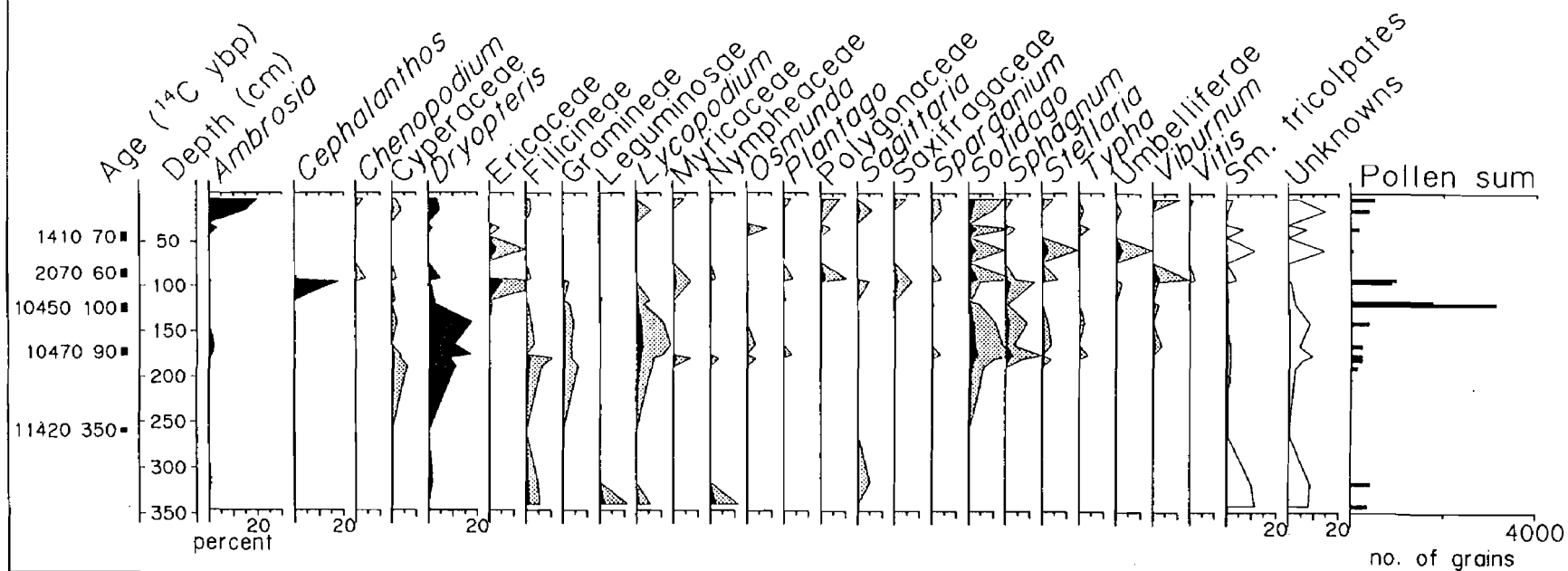
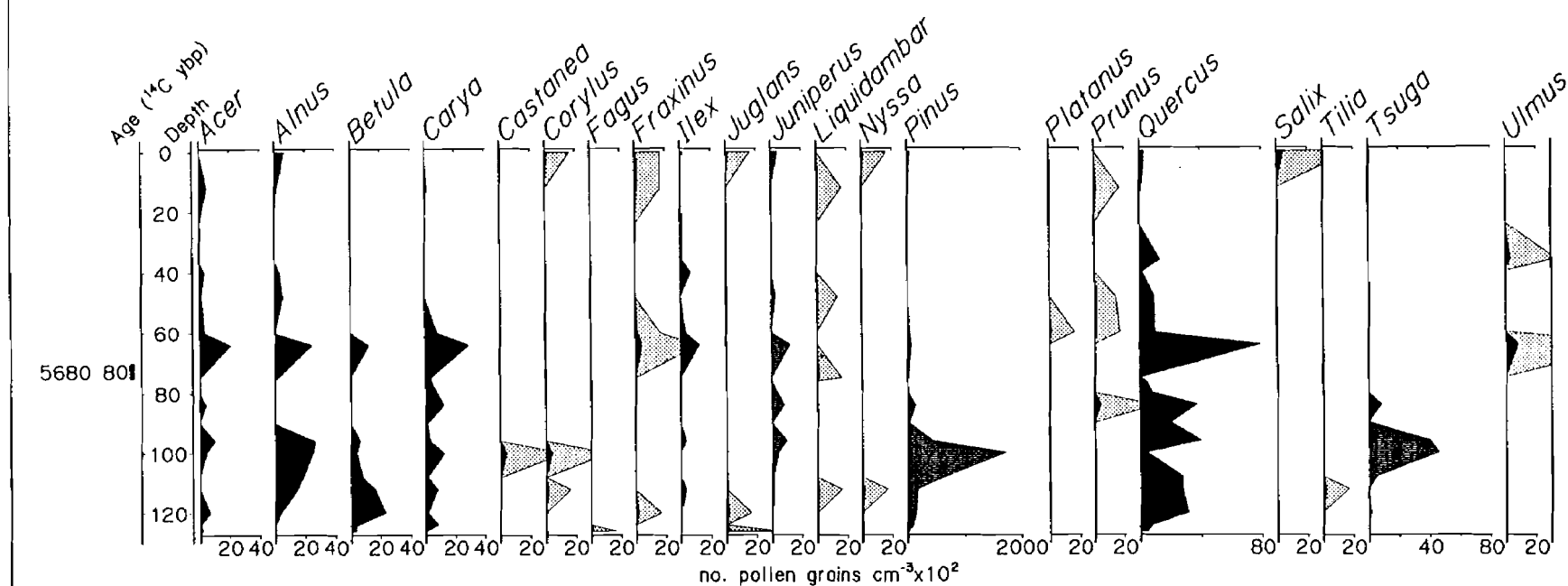


Figure 4. Pollen percentages of Core PC-14. Stippled areas indicate 5X exaggeration.

DELAWARE CORE PC17 -- ARBOREAL POLLEN CONCENTRATIONS



DELAWARE CORE PC17 -- NON-ARBOREAL POLLEN CONCENTRATIONS

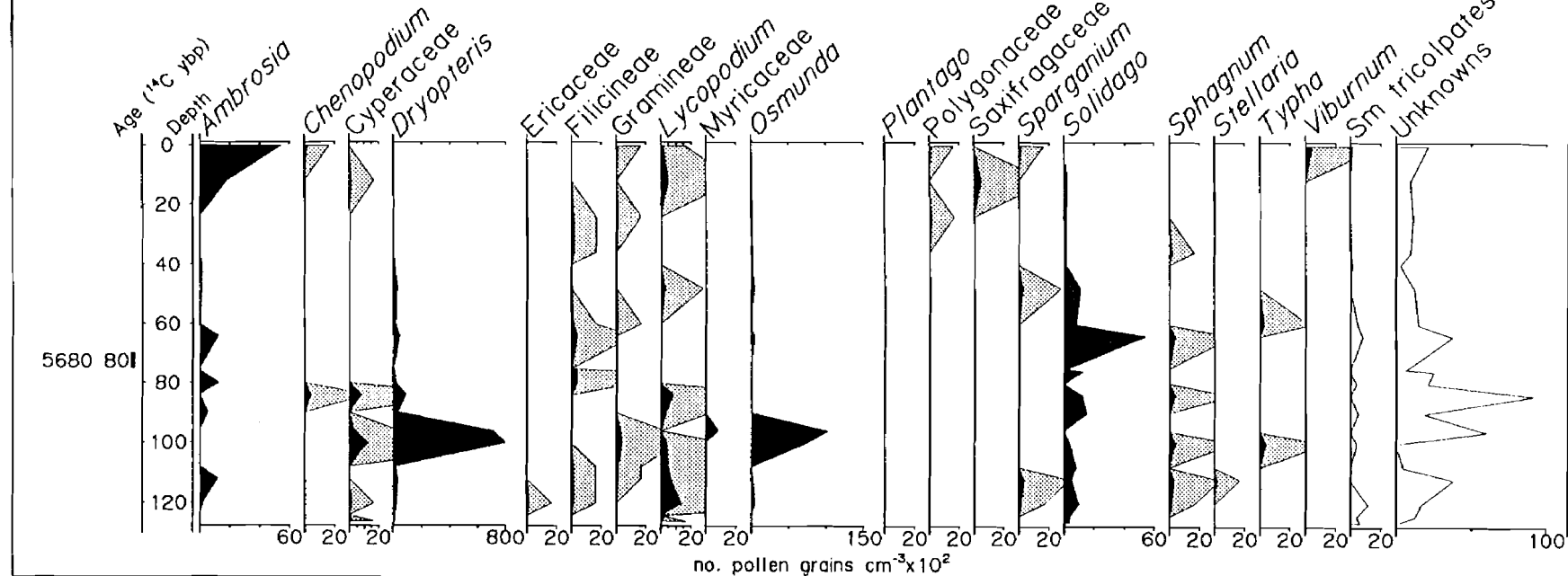
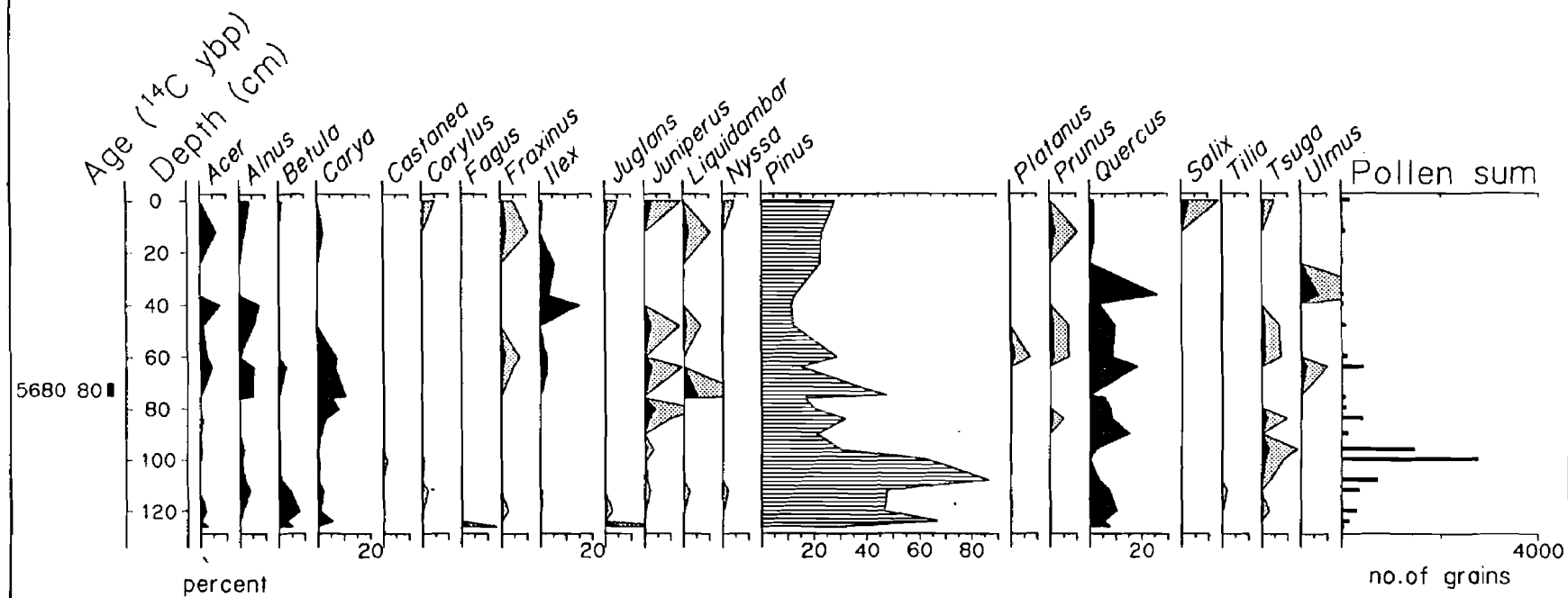


Figure 5. Pollen concentrations for Core PC-17. Stippling indicates 5X exaggeration.

DELAWARE CORE PC17 -- ARBOREAL POLLEN PERCENTAGES



DELAWARE CORE PC17 -- NON-ARBOREAL POLLEN PERCENTAGES

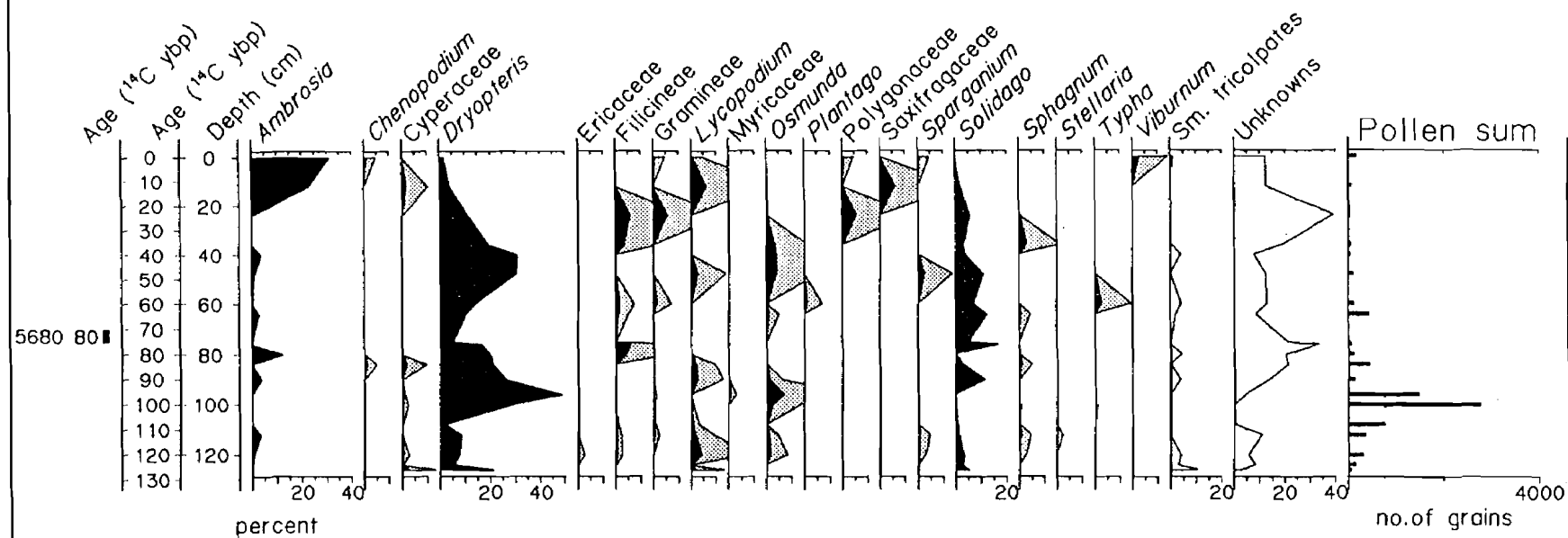


Figure 6. Pollen percentages of Core PC-17. Stippling indicates 5X exaggeration.

DELAWARE CORE PC17 -- POLLEN -- COUNTS (number in one aliquot)														
Depth	Total no.	Acer	Alnus	Betula	Carya	Castanea	Celtis	Corylus	Fagus	Fraxinus	Ilex	Juglans	Juniperus	Liquid
0-2	106		4	1				1		1	1	1	3	
12-14	48	3	1		1					1				1
24-26	18										1			
36-38	31										1			
40-42	26	2	2								4			
48-50	73	1	4										2	1
60-61	70	2			5					1	2			
64-66	106	5	6	3	7					1	3		3	
75-76	19		1		2									1
76-78	18	0			1									
80-82	25				2								1	
84-86	104	1			3								2	
90-92	80				1									
96-98	880	6	16	4	2						2		6	
100-102	668	1	6	1	3	1		1					1	
108-110	447		11	5	1								1	
112-114	215		9	10	5			1			2		1	1
120-122	181	4	2	14	1					1		1		
124-126	36			1	2									
128-130	38	1		2					1			2		
DELAWARE CORE PC17 POLLEN - PERCENTAGES OF TOTAL POLLEN														
Depth	Total no.	Acer	Alnus	Betula	Carya	Castanea	Celtis	Corylus	Fagus	Fraxinus	Ilex	Juglans	Juniperus	Liquid
0-2		0	0.037736	0.009434	0	0	0	0.009434	0	0.009434	0.009434	0.009434	0.028302	0
12-14		0.0625	0.020833	0	0.020833	0	0	0	0	0.020833	0	0	0	0.020833
24-26		0	0	0	0	0	0	0	0	0	0.055556	0	0	0
36-38		0	0	0	0	0	0	0	0	0	0.032258	0	0	0
40-42		0.076923	0.076923	0	0	0	0	0	0	0	0.153846	0	0	0
48-50		0.013699	0.054795	0	0	0	0	0	0	0	0	0	0.027397	0.013699
60-61		0.028571	0	0	0.071429	0	0	0	0	0.014286	0.028571	0	0	0
64-66		0.04717	0.056604	0.028302	0.066038	0	0	0	0	0.009434	0.028302	0	0.028302	0
75-76		0	0.052632	0	0.105263	0	0	0	0	0	0	0	0	0.052632
76-78		0	0	0	0.055556	0	0	0	0	0	0	0	0	0
80-82		0	0	0	0.08	0	0	0	0	0	0	0	0.04	0
84-86		0.009615	0	0	0.028846	0	0	0	0	0	0	0	0.019231	0
90-92		0	0	0	0.0125	0	0	0	0	0	0	0	0	0
96-98		0.006818	0.018182	0.004545	0.002273	0	0	0	0	0	0.002273	0	0.006818	0
100-102		0.001497	0.008982	0.001497	0.004491	0.001497	0	0.001497	0	0	0	0	0.001497	0
108-110		0	0.024609	0.011186	0.002237	0	0	0	0	0	0	0	0.002237	0
112-114		0	0.04186	0.046512	0.023256	0	0	0.004651	0	0	0.009302	0	0.004651	0.004651
120-122		0.022099	0.01105	0.077348	0.005525	0	0	0	0	0.005525	0	0.005525	0	0
124-126		0	0	0.027778	0.055556	0	0	0	0	0	0	0	0	0
126-128		0.026316	0	0.052632	0	0	0	0	0.026316	0	0	0.052632	0	0

DELAWARE CORE PC17 POLLEN - CONCENTRATIONS (NUMBER POLLEN PER CC)														
Depth	Total no.	Acer	Alnus	Betula	Carya	Castanea	Celtis	Corylus	Fagus	Fraxinus	Ilex	Juglans	Juniperus	Liquid
0		0	666.6667	166.6667	0	0	0	166.6667	0	166.6667	166.6667	166.6667	500	0
12		500	166.6667	0	166.6667	0	0	0	0	166.6667	0	0	0	166.6667
24		0	0	0	0	0	0	0	0	0	166.6667	0	0	0
36		0	0	0	0	0	0	0	0	0	166.6667	0	0	0
40		333.3333	333.3333	0	0	0	0	0	0	0	666.6667	0	0	0
48		138.8889	555.5556	0	0	0	0	0	0	0	0	0	277.7778	138.8889
60		333.3333	0	0	833.3333	0	0	0	0	166.6667	333.3333	0	0	0
64		2083.333	2500	1250	2916.667	0	0	0	0	416.6667	1250	0	1250	0
75		0	166.6667	0	333.3333	0	0	0	0	0	0	0	0	166.6667
76		0	0	0	416.6667	0	0	0	0	0	0	0	0	0
80		0	0	0	833.3333	0	0	0	0	0	0	0	416.6667	0
84		416.6667	0	0	1250	0	0	0	0	0	0	0	833.3333	0
90		0	0	0	166.6667	0	0	0	0	0	0	0	0	0
96		1000	2666.667	666.6667	333.3333	0	0	0	0	0	333.3333	0	1000	0
100		416.6667	2500	416.6667	1250	416.6667	0	416.6667	0	0	0	0	416.6667	0
108		0	1833.333	833.3333	166.6667	0	0	0	0	0	0	0	166.6667	0
112		0	1500	1666.667	833.3333	0	0	166.6667	0	0	333.3333	0	166.6667	166.6667
120		666.6667	333.3333	2333.333	166.6667	0	0	0	0	166.6667	0	166.6667	0	0
124		0	0	416.6667	833.3333	0	0	0	0	0	0	0	0	0
126		166.6667	0	333.3333	0	0	0	0	166.6667	0	0	333.3333	0	0

Magnolia	Morus	Nyssa	Pinus	Platanus	Prunus	Quercus	Robinia	Salix	Tilia	Tsuga	Ulmus	Ambrosia	Cephalan	Chenop
		1	30			2		3		1		33		1
			11		1	1						11		
			4											
			4			8					2			
			3			1						1		
			9		1	7				1		1		
			20	1	1	6				1				
			16			19					2	3		
			9											
			3			1								
			5			2						3		
			33		1	9				2				1
			17			12						3		
			264			24				24				
			418			1				11				
			386			17				3				
		1	103			17			1			7		
			84			19				1		1		
			24			2								
			12			3								
Magnolia	Morus	Nyssa	Pinus	Platanus	Prunus	Quercus	Robinia	Salix	Tilia	Tsuga	Ulmus	Ambrosia	Cephalan	Chenop
0	0	0.009434	0.283019	0	0	0.018868	0	0.028302	0	0.009434	0	0.311321	0	0.009434
0	0	0	0.229167	0	0.020833	0.020833	0	0	0	0	0	0.229167	0	0
0	0	0	0.222222	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0.129032	0	0	0.258065	0	0	0	0	0.064516	0	0	0
0	0	0	0.115385	0	0	0.038462	0	0	0	0	0	0.038462	0	0
0	0	0	0.123288	0	0.013699	0.09589	0	0	0	0.013699	0	0.013699	0	0
0	0	0	0.285714	0.014286	0.014286	0.085714	0	0	0	0.014286	0	0	0	0
0	0	0	0.150943	0	0	0.179245	0	0	0	0	0.018868	0.028302	0	0
0	0	0	0.473684	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0.166667	0	0	0.055556	0	0	0	0	0	0	0	0
0	0	0	0.2	0	0	0.08	0	0	0	0	0	0.12	0	0
0	0	0	0.317308	0	0.009615	0.086538	0	0	0	0.019231	0	0	0	0.009615
0	0	0	0.2125	0	0	0.15	0	0	0	0	0	0.0375	0	0
0	0	0	0.3	0	0	0.027273	0	0	0	0.027273	0	0	0	0
0	0	0	0.625749	0	0	0.001497	0	0	0	0.016467	0	0	0	0
0	0	0	0.863535	0	0	0.038031	0	0	0	0.006711	0	0	0	0
0	0	0.004651	0.47907	0	0	0.07907	0	0	0.004651	0	0	0.032558	0	0
0	0	0	0.464088	0	0	0.104972	0	0	0	0.005525	0	0.005525	0	0
0	0	0	0.666667	0	0	0.055556	0	0	0	0	0	0	0	0
0	0	0	0.315789	0	0	0.078947	0	0	0	0	0	0	0	0

Magnolia	Morus	Nyssa	Pinus	Platanus	Prunus	Quercus	Robinia	Salix	Tilia	Tsuga	Ulmus	Ambrosia	Cephalan	Chenop
0	0	166.6667	5000	0	0	333.3333	0	500	0	166.6667	0	5500	0	166.6667
0	0	0	1833.333	0	166.6667	166.6667	0	0	0	0	0	1833.333	0	0
0	0	0	666.6667	0	0	0	0	0	0	0	0	0	0	0
0	0	0	666.6667	0	0	1333.333	0	0	0	0	333.3333	0	0	0
0	0	0	500	0	0	166.6667	0	0	0	0	0	166.6667	0	0
0	0	0	1250	0	138.8889	972.2222	0	0	0	138.8889	0	138.8889	0	0
0	0	0	3333.333	166.6667	166.6667	1000	0	0	0	166.6667	0	0	0	0
0	0	0	6666.667	0	0	7916.667	0	0	0	0	833.3333	1250	0	0
0	0	0	1500	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1250	0	0	416.6667	0	0	0	0	0	0	0	0
0	0	0	2083.333	0	0	833.3333	0	0	0	0	0	1250	0	0
0	0	0	13750	0	416.6667	3750	0	0	0	833.3333	0	0	0	416.6667
0	0	0	2833.333	0	0	2000	0	0	0	0	0	500	0	0
0	0	0	44000	0	0	4000	0	0	0	4000	0	0	0	0
0	0	0	174166.7	0	0	416.6667	0	0	0	4583.333	0	0	0	0
0	0	0	64333.33	0	0	2833.333	0	0	0	500	0	0	0	0
0	0	166.6667	17166.67	0	0	2833.333	0	0	166.6667	0	0	1166.667	0	0
0	0	0	14000	0	0	3166.667	0	0	0	166.6667	0	166.6667	0	0
0	0	0	10000	0	0	833.3333	0	0	0	0	0	0	0	0
0	0	0	2000	0	0	500	0	0	0	0	0	0	0	0

Cyperac	Dryop	Ericac	Filicin	Gramin	Legumin	Lycopod	Myricac	Nymphea	Osmunda	Plantago	Polygon	Sagittaria	Saxifrag	Spargan
	2			1		1					1			1
1	2					3				1			3	
	2		1	1							1			
	6		1						1					
	8								1					
	22					2			3					2
	10		1	1					1					
	11		1											
	1													
	3		1											
	5		1											
2	22					2								
	21					2			1					
2	428			2			2		62					
3	192			1		1			18					
	10		1	1		3								
	18		1	1		4			2					2
1	14	1	1			8			3					1
	2													
1	8					1								
Cyperac	Dryop	Ericac	Filicin	Gramin	Legumin	Lycopod	Myricac	Nymphea	Osmunda	Plantago	Polygon	Sagittaria	Saxifrag	Spargan
0	0.018868	0	0	0.009434	0	0.009434	0	0	0	0	0.009434	0	0	0.009434
0.020833	0.041667	0	0	0	0	0.0625	0	0	0	0.020833	0	0	0.0625	0
0	0.111111	0	0.055556	0.055556	0	0	0	0	0	0	0.055556	0	0	0
0	0.193548	0	0.032258	0	0	0	0	0	0.032258	0	0	0	0	0
0	0.307692	0	0	0	0	0	0	0	0.038462	0	0	0	0	0
0	0.30137	0	0	0	0	0.027397	0	0	0.041096	0	0	0	0	0.027397
0	0.142857	0	0.014286	0.014286	0	0	0	0	0	0	0	0	0	0
0	0.103774	0	0.009434	0	0	0	0	0	0.009434	0	0	0	0	0
0	0.052632	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.166667	0	0.055556	0	0	0	0	0	0	0	0	0	0	0
0	0.2	0	0.04	0	0	0	0	0	0	0	0	0	0	0
0.019231	0.211538	0	0	0	0	0.019231	0	0	0	0	0	0	0	0
0	0.2625	0	0	0	0	0.025	0	0	0.0125	0	0	0	0	0
0.002273	0.486364	0	0	0.002273	0	0	0.002273	0	0.070455	0	0	0	0	0
0.004491	0.287425	0	0	0.001497	0	0.001497	0	0	0.026946	0	0	0	0	0
0	0.022371	0	0.002237	0.002237	0	0.006711	0	0	0	0	0	0	0	0
0	0.083721	0	0.004651	0.004651	0	0.018605	0	0	0.009302	0	0	0	0	0.009302
0.005525	0.077348	0.005525	0.005525	0	0	0.044199	0	0	0.016575	0	0	0	0	0.005525
0	0.055556	0	0	0	0	0	0	0	0	0	0	0	0	0
0.026316	0.210526	0	0	0	0	0.026316	0	0	0	0	0	0	0	0

Cyperac	Dryop	Ericac	Filicin	Gramin	Legumin	Lycopod	Myricac	Nymphea	Osmunda	Plantago	Polygon	Sagittaria	Saxifrag	Spargan
0	333.3333	0	0	166.6667	0	166.6667	0	0	0	0	166.6667	0	0	166.6667
166.6667	333.3333	0	0	0	0	500	0	0	0	166.6667	0	0	500	0
0	333.3333	0	166.6667	166.6667	0	0	0	0	0	0	166.6667	0	0	0
0	1000	0	166.6667	0	0	0	0	0	166.6667	0	0	0	0	0
0	1333.333	0	0	0	0	0	0	0	166.6667	0	0	0	0	0
0	3055.556	0	0	0	0	277.7778	0	0	416.6667	0	0	0	0	277.7778
0	1666.667	0	166.6667	166.6667	0	0	0	0	0	0	0	0	0	0
0	4583.333	0	416.6667	0	0	0	0	0	416.6667	0	0	0	0	0
0	166.6667	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1250	0	416.6667	0	0	0	0	0	0	0	0	0	0	0
0	2083.333	0	416.6667	0	0	0	0	0	0	0	0	0	0	0
833.3333	9166.667	0	0	0	0	833.3333	0	0	0	0	0	0	0	0
0	3500	0	0	0	0	333.3333	0	0	166.6667	0	0	0	0	0
333.3333	71333.33	0	0	333.3333	0	0	833.3333	0	10333.33	0	0	0	0	0
1250	80000	0	0	416.6667	0	416.6667	0	0	7500	0	0	0	0	0
0	1666.667	0	166.6667	166.6667	0	500	0	0	0	0	0	0	0	0
0	3000	0	166.6667	166.6667	0	666.6667	0	0	333.3333	0	0	0	0	333.3333
166.6667	2333.333	166.6667	166.6667	0	0	1333.333	0	0	500	0	0	0	0	166.6667
0	833.3333	0	0	0	0	0	0	0	0	0	0	0	0	0
166.6667	1333.333	0	0	0	0	166.6667	0	0	0	0	0	0	0	0

Solidago	Sphagnum	Stellaria	Typha	Umbellif	Viburnum	Violac	Vitis	Sm tricolp	Unknown					
					3			1	13					
1									6					
1									7					
1	1								6					
1								1	2					
8									9					
5				2				3	9					
13	1							2	9					
1									4					
3									6					
								1	5					
3	1								22					
9								3	11					Rhamnus 1
									36					Abies 6, Picea 4, Caryophyllaceae 2
1	1			1				1	5					
5									3					Caryophyllaceae 1
3	2	1							23					Myriophyllum 1
6	1							7	10					Selaginella 2
1								1	3					
2								4	1					Picea 1
Solidago	Sphagnum	Stellaria	Typha	Umbellif	Viburnum	Violac	Vitis	Sm tricolp	Unknown					
0	0	0	0	0	0.028302	0	0	0.009434	0.122642					
0.020833	0	0	0	0	0	0	0	0	0.125					
0.055556	0	0	0	0	0	0	0	0	0.388889					
0.032258	0.032258	0	0	0	0	0	0	0	0.193548					
0.038462	0	0	0	0	0	0	0	0.038462	0.076923					
0.109589	0	0	0	0	0	0	0	0	0.123288					
0.071429	0	0	0.028571	0	0	0	0	0.042857	0.128571					
0.122842	0.009434	0	0	0	0	0	0	0.018868	0.084906					
0.052632	0	0	0	0	0	0	0	0	0.210526					
0.166667	0	0	0	0	0	0	0	0	0.333333					
0	0	0	0	0	0	0	0	0.04	0.2					
0.028846	0.009615	0	0	0	0	0	0	0	0.211538					
0.1125	0	0	0	0	0	0	0	0.0375	0.1375					
0	0	0	0	0	0	0	0	0	0.040909					
0.001497	0.001497	0	0.001497	0	0	0	0	0.001497	0.007485					
0.011186	0	0	0	0	0	0	0	0	0.006711					
0.013953	0.009302	0.004651	0	0	0	0	0	0	0.106977					
0.033149	0.005525	0	0	0	0	0	0	0.038674	0.055249					
0.027778	0	0	0	0	0	0	0	0.027778	0.083333					
0.052632	0	0	0	0	0	0	0	0.105263	0.026316					

Solidago	Sphagnum	Stellaria	Typha	Umbellif	Viburnum	Violac	Vitis	Sm tricolp	Unknown					
0	0	0	0	0	500	0	0	166.6667	2166.667					
166.6667	0	0	0	0	0	0	0	0	1000					
166.6667	0	0	0	0	0	0	0	0	1166.667					
166.6667	166.6667	0	0	0	0	0	0	0	1000					
166.6667	0	0	0	0	0	0	0	166.6667	333.3333					
1111.111	0	0	0	0	0	0	0	0	1250					
833.3333	0	0	333.3333	0	0	0	0	500	1500					
5416.667	416.6667	0	0	0	0	0	0	833.3333	3750					
166.6667	0	0	0	0	0	0	0	0	666.6667					
1250	0	0	0	0	0	0	0	0	2500					
0	0	0	0	0	0	0	0	416.6667	2083.333					
1250	416.6667	0	0	0	0	0	0	0	9166.667					
1500	0	0	0	0	0	0	0	500	1833.333					
0	0	0	0	0	0	0	0	0	6000					
416.6667	416.6667	0	416.6667	0	0	0	0	416.6667						
833.3333	0	0	0	0	0	0	0	0	500					
500	333.3333	166.6667	0	0	0	0	0	0	3833.333					
1000	166.6667	0	0	0	0	0	0	1166.667	1666.667					
416.6667	0	0	0	0	0	0	0	416.6667	1250					
333.3333	0	0	0	0	0	0	0	666.6667	166.6667					

DELAWARE CORE PC14 POLLEN -- COUNTS IN ONE ALIQUOT AT EACH DEPTH LEVEL

Depth	Total no.	Acer	Alnus	Betula	Carya	Castanea	Celtis	Corylus	Fagus	Fraxinus	Ilex	Juglans	Juniper	Liquid
1-2	311	8	50	8	17	1				2	6	5		
14-15	242	3	19	1	9	2			1	3	15	4	1	2
29-30	1	0												
34-35	116	1	16	4	9					4	6			
43-44	1	0												
58-59	34	0	4	2							1		1	
72-73	1	0												
91-92	64	2	2	3	2					1	1	1		
94-95	1060	4	24	4	6					2	2		2	
116-117	1048	4	36	17	4			3				3		1
119-120	1877	11	86	80	3	4	1		3			2	18	
139-140	229	7	10	17				3					2	
164-165	373	1	3	5	4									
175-176	139	2	6	5	1	1		1		1			1	
179-180	141	2	6	11	1			2			1	1	2	
188-189	79	2	2											
260-265	1	0												
315-316	102	4	1	2	4	2				1		2	1	
339-340	86	4			1							2		

DELAWARE CORE PC14 POLLEN - PERCENTAGES BASED ON TOTAL POLLEN COUNT

Depth	Total no.	Acer	Alnus	Betula	Carya	Castanea	Celtis	Corylus	Fagus	Fraxinus	Ilex	Juglans	Juniper	Liquid
1-2		0.025723	0.160772	0.025723	0.054662	0.003215	0	0	0	0.006431	0.019293	0.016077	0	0
14-15		0.012397	0.078512	0.004132	0.03719	0.008264	0	0	0.004132	0.012397	0.061983	0.016529	0.004132	0.008264
29-30		0	0	0	0	0	0	0	0	0	0	0	0	0
34-35		0.007692	0.123077	0.030769	0.069231	0	0	0	0	0.030769	0.046154	0	0	0
43-44		0	0	0	0	0	0	0	0	0	0	0	0	0
58-59		0	0.117647	0.058824	0	0	0	0	0	0	0.029412	0	0.029412	0
72-73		0	0	0	0	0	0	0	0	0	0	0	0	0
91-92		0.03125	0.03125	0.046875	0.03125	0	0	0	0	0.015625	0.015625	0.015625	0	0
94-95		0.003774	0.022642	0.003774	0.00566	0	0	0	0	0.001887	0.001887	0	0.001887	0
116-117		0.003817	0.034351	0.016221	0.003817	0	0	0.002863	0	0	0	0.002863	0	0.000954
119-120		0.00586	0.045818	0.042621	0.001598	0.002131	0.000533	0	0.001598	0	0	0.001066	0.00959	0
139-140		0.030568	0.043668	0.074236	0	0	0	0.0131	0	0	0	0	0.008734	0
164-165		0.002681	0.008043	0.013405	0.010724	0	0	0	0	0	0	0	0	0
175-176		0.014388	0.043165	0.035971	0.007194	0.007194	0	0.007194	0	0.007194	0	0	0.007194	0
179-180		0.014184	0.042553	0.078014	0.007092	0	0	0.014184	0	0	0.007092	0.007092	0.014184	0
188-189		0.025316	0.025316	0	0	0	0	0	0	0	0	0	0	0
260-265		0	0	0	0	0	0	0	0	0	0	0	0	0
315-316		0.039216	0.009804	0.019608	0.039216	0.019608	0	0	0	0.009804	0	0.019608	0.009804	0
339-340		0.046512	0	0	0.011628	0	0	0	0	0	0	0.023256	0	0

DELAWARE CORE PC14 POLLEN - CONCENTRATIONS (NUMBER POLLEN PER CC)														
Depth	Total no.	Acer	Alnus	Betula	Carya	Castanea	Celtis	Corylus	Fagus	Fraxinus	Ilex	Juglans	Juniper	Liquid
1-2		1333.333	8333.333	1333.333	2833.333	166.6667	0	0	0	333.3333	1000	833.3333	0	0
14-15		500	3166.667	166.6667	1500	333.3333	0	0	166.6667	500	2500	666.6667	166.6667	333.3333
29-30		0	0	0	0	0	0	0	0	0	0	0	0	0
34-35		166.6667	2666.667	666.6667	1500	0	0	0	0	666.6667	1000	0	0	0
43-44		0	0	0	0	0	0	0	0	0	0	0	0	0
58-59		0	666.6667	333.3333	0	0	0	0	0	0	166.6667	0	166.6667	0
72-73		0	0	0	0	0	0	0	0	0	0	0	0	0
91-92		833.3333	833.3333	1250	833.3333	0	0	0	0	416.6667	416.6667	416.6667	0	0
94-95		1666.667	10000	1666.667	2500	0	0	0	0	833.3333	833.3333	0	833.3333	0
116-117		666.6667	6000	2833.333	666.6667	0	0	500	0	0	0	500	0	166.6667
119-120		1833.333	14333.33	13333.33	500	666.6667	166.6667	0	500	0	0	333.3333	3000	0
139-140		1166.667	1666.667	2833.333	0	0	0	500	0	0	0	0	333.3333	0
164-165		166.6667	500	833.3333	666.6667	0	0	0	0	0	0	0	0	0
175-176		333.3333	1000	833.3333	166.6667	166.6667	0	166.6667	0	166.6667	0	0	166.6667	0
179-180		333.3333	1000	1833.333	166.6667	0	0	333.3333	0	0	166.6667	166.6667	333.3333	0
188-189		333.3333	333.3333	0	0	0	0	0	0	0	0	0	0	0
260-265		0	0	0	0	0	0	0	0	0	0	0	0	0
315-316		1666.667	416.6667	833.3333	1666.667	833.3333	0	0	0	416.6667	0	833.3333	416.6667	0
339-340		1666.667	0	0	416.6667	0	0	0	0	0	0	833.3333	0	0

Magnolia	Morus	Nyssa	Pinus	Platanus	Prunus	Quercus	Robinia	Salix	Tilia	Tsuga	Ulmus	Ambrosia	Cephalan	Chenop
		1	42	1	2	18	1	3			6	63	1	2
			40		1	28				3	2	38		
			23			19						4		
			5			7								
			32			1					1			
			920			4				8	4			
			861		1	22		1		3		1		
1	2	2	1429			36			1	9	4	13		
1	1		96			12								
			80			6				3		3		
			55			7					1	2		
		1	69			5						1		
			51			5				2				
			32	1	2	25					1	1		
		2	34			21					1			
Magnolia	Morus	Nyssa	Pinus	Platanus	Prunus	Quercus	Robinia	Salix	Tilia	Tsuga	Ulmus	Ambrosia	Cephalan	Chenop
0	0	0.003215	0.135048	0.003215	0.006431	0.057878	0.003215	0.009646	0	0	0.019293	0.202572	0.003215	0.006431
0	0	0	0.165289	0	0.004132	0.115702	0	0	0	0.012397	0.008264	0.157025	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0.176923	0	0	0.146154	0	0	0	0	0	0.030769	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0.147059	0	0	0.205882	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0.5	0	0	0.015625	0	0	0	0	0.015625	0	0	0
0	0	0	0.867925	0	0	0.003774	0	0	0	0.007547	0.003774	0	0	0
0	0	0	0.821565	0	0.000954	0.020992	0	0.000954	0	0.002863	0	0.000954	0	0
0.000533	0.001066	0.001066	0.761321	0	0	0.01918	0	0	0.000533	0.004795	0.002131	0.006926	0	0
0.004367	0.004367	0	0.419214	0	0	0.052402	0	0	0	0	0	0	0	0
0	0	0	0.214477	0	0	0.016086	0	0	0	0.008043	0	0.008043	0	0
0	0	0	0.395683	0	0	0.05036	0	0	0	0	0.007194	0.014388	0	0
0	0	0.007092	0.489362	0	0	0.035461	0	0	0	0	0	0.007092	0	0
0	0	0	0.64557	0	0	0.063291	0	0	0	0.025316	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0.313725	0.009804	0.019608	0.245098	0	0	0	0	0.009804	0.009804	0	0
0	0	0.023256	0.395349	0	0	0.244186	0	0	0	0	0.011628	0	0	0

Magnolia	Morus	Nyssa	Pinus	Platanus	Prunus	Quercus	Robinia	Salix	Tilia	Tsuga	Ulmus	Ambrosia	Cephalan	Chenop
0	0	166.6667	7000	166.6667	333.3333	3000	166.6667	500	0	0	1000	10500	166.6667	333.3333
0	0	0	6666.667	0	166.6667	4666.667	0	0	0	500	333.3333	6333.333	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	3833.333	0	0	3166.667	0	0	0	0	0	666.6667	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	833.3333	0	0	1166.667	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	13333.33	0	0	416.6667	0	0	0	0	416.6667	0	0	0
0	0	0	383333.3	0	0	1666.667	0	0	0	3333.333	1666.667	0	0	0
0	0	0	143500	0	166.6667	3666.667	0	166.6667	0	500	0	166.6667	0	0
166.6667	333.3333	333.3333	238166.7	0	0	6000	0	0	166.6667	1500	666.6667	2166.667	0	0
166.6667	166.6667	0	16000	0	0	2000	0	0	0	0	0	0	0	0
0	0	0	13333.33	0	0	1000	0	0	0	500	0	500	0	0
0	0	0	9166.667	0	0	1166.667	0	0	0	0	166.6667	333.3333	0	0
0	0	166.6667	11500	0	0	833.3333	0	0	0	0	0	166.6667	0	0
0	0	0	8500	0	0	833.3333	0	0	0	333.3333	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	13333.33	416.6667	833.3333	10416.67	0	0	0	0	416.6667	416.6667	0	0
0	0	833.3333	14166.67	0	0	8750	0	0	0	0	416.6667	0	0	0

Cyperac	Dryop	Ericac	Filicin	Gramin	Legumin	Lycopod	Myricac	Nymphaea	Osmunda	Plantago	Polygon	Sagittaria	Saxifrag	Spargan
1	12		1				3			2	5		3	2
2	12		1			3					2	3		2
	2	1						1	2		1			
		1						1						
	6	1							2					
2	22		4			8			10					
3	31	1		1	2	12			1	2				
	48	5	3	10		12	2	1	2					4
1	41		1	2		5								
	16		1	1		4		1	1					
1	24			1		3				1				1
1	13		3	1		2	2		1					
1	9		1	1		1								
	2		1									1		
			1		2	1								
Cyperac	Dryop	Ericac	Filicin	Gramin	Legumin	Lycopod	Myricac	Nymphaea	Osmunda	Plantago	Polygon	Sagittaria	Saxifrag	Spargan
0.003215	0.038585	0	0.003215	0		0	0.009646	0	0	0.006431	0.016077	0	0.009646	0.006431
0.008264	0.049587	0	0.004132	0		0.012397	0	0	0	0	0.008264	0.012397	0	0.008264
0	0	0	0	0		0	0	0	0	0	0	0	0	0
0	0.015385	0.007692	0	0		0	0	0.007692	0.015385	0	0.007692	0	0	0
0	0	0	0	0		0	0	0	0	0	0	0	0	0
0	0	0.029412	0	0		0	0	0.029412	0	0	0	0	0	0
0	0	0	0	0		0	0	0	0	0	0	0	0	0
0	0.09375	0.015625	0	0		0	0	0	0.03125	0	0	0	0	0
0.001887	0.020755	0	0.003774	0		0.007547	0	0	0.009434	0	0	0	0	0
0.002863	0.02958	0.000954	0	0.000954	2	0.01145	0	0	0.000954	0.001908	0	0	0	0
0	0.025573	0.002664	0.001598	0.005328	0	0.006393	0.001066	0.000533	0.001066	0	0	0	0	0.002131
0.004367	0.179039	0	0.004367	0.008734		0.021834	0	0	0	0	0	0	0	0
0	0.042895	0	0.002681	0.002681		0.010724	0	0.002681	0.002681	0	0	0	0	0
0.007194	0.172662	0	0	0.007194		0.021583	0	0	0	0.007194	0	0	0	0.007194
0.007092	0.092199	0	0.021277	0.007092		0.014184	0.014184	0	0.007092	0	0	0	0	0
0.012658	0.113924	0	0.012658	0.012658		0.012658	0	0	0	0	0	0	0	0
0	0	0	0	0		0	0	0	0	0	0	0	0	0
0	0.019608	0	0.009804	0		0	0	0	0	0	0	0.009804	0	0
0	0	0	0.011628	0	0	0.011628	0	0	0	0	0	0	0	0

Cyperac	Dryop	Ericac	Filicin	Gramin	Legumin	Lycopod	Myricac	Nymphaea	Osmunda	Plantago	Polygon	Sagittaria	Saxifrag	Spargan
166.6667	2000	0	166.6667	0	0	0	500	0	0	333.3333	833.3333	0	500	333.3333
333.3333	2000	0	166.6667	0	0	500	0	0	0	0	333.3333	500	0	333.3333
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	333.3333	166.6667	0	0	0	0	0	166.6667	333.3333	0	166.6667	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	166.6667	0	0	0	0	0	166.6667	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	2500	416.6667	0	0	0	0	0	0	833.3333	0	0	0	0	0
833.3333	9166.667	0	1666.667	0	0	3333.333	0	0	4166.667	0	0	0	0	0
500	5166.667	166.6667	0	166.6667	333.3333	2000	0	0	166.6667	333.3333	0	0	0	0
0	8000	833.3333	500	1666.667	0	2000	333.3333	166.6667	333.3333	0	0	0	0	666.6667
166.6667	6833.333	0	166.6667	333.3333	0	833.3333	0	0	0	0	0	0	0	0
0	2666.667	0	166.6667	166.6667	0	666.6667	0	166.6667	166.6667	0	0	0	0	0
166.6667	4000	0	0	166.6667	0	500	0	0	0	166.6667	0	0	0	166.6667
166.6667	2166.667	0	500	166.6667	0	333.3333	333.3333	0	166.6667	0	0	0	0	0
166.6667	1500	0	166.6667	166.6667	0	166.6667	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	833.3333	0	416.6667	0	0	0	0	0	0	0	0	416.6667	0	0
0	0	0	416.6667	0	833.3333	416.6667	0	0	0	0	0	0	0	0

Solidago	Sphagnum	Stellaria	Typha	Umbellif	Viburnum	Violac	Vitis	Sm. tricolp	Unknown					
9	2	3			7		1		9	14				
5			1	1					2	36				
4	1		1						8	9				
1		1		1					4	5				
1	1			1			1			5				
6	8				2				4	14				
2	5			1					6	24				
17	4				9				2	53				
5	4	1	1							19				
4	1	1			1				2	6				
5	4		1						2	13				
3	2	1							2	8	Selaginella - 1			
1									1	2				
									10	9				
									10	7	4 Rosaceace (Dryas?), Artemisia type, Abies? different sizes of pine			
Solidago	Sphagnum	Stellaria	Typha	Umbellif	Viburnum	Violac	Vitis	Sm. tricolp	Unknown					
0.028939	0.006431	0.009646	0	0	0.022508	0	0.003215	0.028939	0.045016					
0.020661	0	0	0.004132	0.004132	0	0	0	0.008264	0.14876					
0	0	0	0	0	0	0	0	0	0					
0.030769	0.007692	0	0.007692	0	0	0	0	0.061538	0.069231					
0	0	0	0	0	0	0	0	0	0					
0.029412	0	0.029412	0	0.029412	0	0	0	0.117647	0.147059					
0	0	0	0	0	0	0	0	0	0					
0.015625	0.015625	0	0.015625	0	0	0.015625	0	0	0.078125					
0.00566	0.007547	0	0	0	0.001887	0	0	0.003774	0.013208					
0.001908	0.004771	0	0	0.000954	0	0	0	0.005725	0.022901					
0.009057	0.002131	0	0	0	0.004795	0	0	0.001066	0.028237					
0.021834	0.017467	0.004367	0.004367	0	0	0	0	0	0.082969					
0.010724	0.002681	0.002681	0	0	0.002681	0	0	0.005362	0.016086					
0.035971	0.028777	0	0.007194	0	0	0	0	0.014388	0.093525					
0.021277	0.014184	0.007092	0	0	0	0	0	0.014184	0.056738					
0.012658	0	0	0	0	0	0	0	0.012658	0.025316					
0	0	0	0	0	0	0	0	0	0					
0	0	0	0	0	0	0	0	0.098039	0.088235					
0	0	0	0	0	0	0	0	0.116279	0.081395					

Solidago	Sphagnum	Stellaria	Typha	Umbellif	Viburnum	Violac	Vitis	Sm. tricolp	Unknown					
1500	333.3333	500	0	0	1166.667	0	166.6667	1500	2333.333					
833.3333	0	0	166.6667	166.6667	0	0	0	333.3333	6000					
0	0	0	0	0	0	0	0	0	0					
666.6667	166.6667	0	166.6667	0	0	0	0	1333.333	1500					
0	0	0	0	0	0	0	0	0	0					
166.6667	0	166.6667	0	166.6667	0	0	0	666.6667	833.3333					
0	0	0	0	0	0	0	0	0	0					
416.6667	416.6667	0	416.6667	0	0	416.6667	0	0	2083.333					
2500	3333.333	0	0	0	833.3333	0	0	1666.667	5833.333					
333.3333	833.3333	0	0	166.6667	0	0	0	1000	4000					
2833.333	666.6667	0	0	0	1500	0	0	333.3333	8833.333					
833.3333	666.6667	166.6667	166.6667	0	0	0	0	0	3166.667					
666.6667	166.6667	166.6667	0	0	166.6667	0	0	333.3333	1000					
833.3333	666.6667	0	166.6667	0	0	0	0	333.3333	2166.667					
500	333.3333	166.6667	0	0	0	0	0	333.3333	1333.333					
166.6667	0	0	0	0	0	0	0	166.6667	333.3333					
0	0	0	0	0	0	0	0	0	0					
0	0	0	0	0	0	0	0	4166.667	3750					
0		0	0	0	0	0	0	4166.667	2916.667					