State of Delaware
DELAWARE GEOLOGICAL SURVEY
Robert R. Jordan, State Geologist

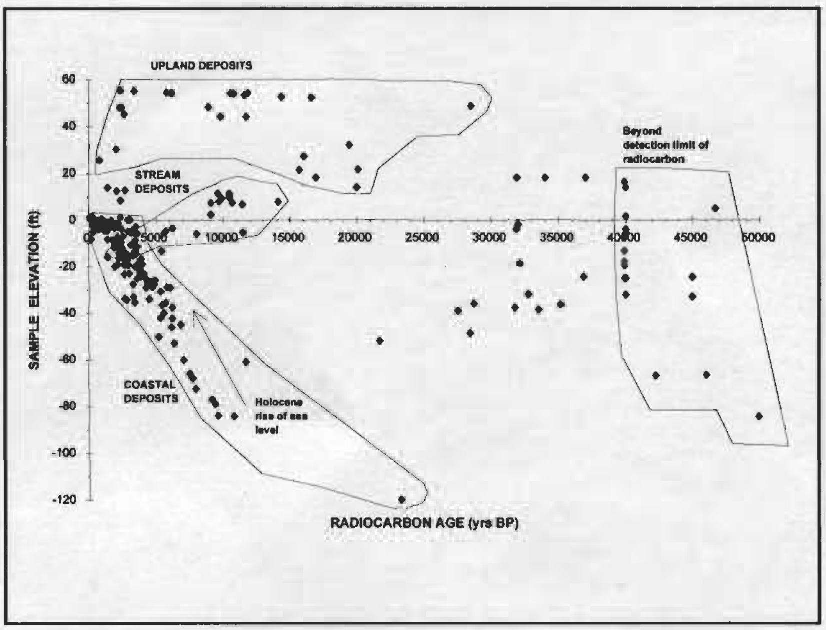
REPORT OF INVESTIGATIONS NO. 54

RADIOCARBON DATES FROM DELAWARE: A COMPILATION

by

Kelvin W. Ramsey

Stefanie J. Baxter



University of Delaware
Newark, Delaware
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CONTENTS

ILLUSTRATIONS

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ABSTRACT

Radiocarbon dates from 231 geologic samples from the offshore, coastal, and upland regions of Delaware have been compiled along with their corresponding locations and other supporting data. These data now form the Delaware Geological Survey Radiocarbon Database. The dates range from a few hundred years to approximately 40,000 yrs (40 ka) BP (before present). All dates younger than about 18,000 yrs have been calibrated using the method of Stuiver and Reimer (1993). A plot of the dates versus the elevations of the samples shows four distinct groupings: those associated with the rise of sea level during the Holocene, those from the uplands, those in modern stream valleys, and those older than the detectable range of present radiocarbon techniques. A fifth group of samples in the 20-38 ka range and from below present sea level are ambiguous and were previously used as evidence for a mid-Wisconsinan high sea stand (Milliman and Emery, 1968).

INTRODUCTION

No compilations of radiocarbon dates of geologic materials from Delaware have been published since the 93 dates reported by Kraft (1976a). Since then, many additional dates have been reported in various publications and unpublished theses and dissertations. Other unpublished dates have not been reported prior to this publication. A total of 231 radiocarbon dates are here recorded, including those originally reported by Belknap (1975) and Kraft (1976a). The purpose of this report is to provide a radiocarbon database for the geologic community that can be utilized for coastal and other geologic studies of the latest Pleistocene and Holocene and that will grow as future data are generated.

Acknowledgments

Many of these dates come from the work of John C. Kraft and his students from the Department of Geology at the University of Delaware. We thank Dr. Kraft for his recognition of the importance of radiocarbon dating and for opening his files for documentation of the reported and some unpublished dates. James E. Pizzuto, also of the Department of Geology, and his students William F. Daniels and Suku J. John have also provided data from the modern coastal stream valleys of Delaware. Funding in support of the compilation was provided by the Minerals Management Service (MMS) of the U.S. Department of the Interior through cooperative agreements with the University of Texas at Austin and the Association of American State Geologists and through a cooperative agreement between the MMS and the Maryland Geological Survey and the Delaware Geological Survey. Funding from Sea Grant provided support for the initial work by Belknap (1975) and Kraft (1976a). Thanks are also given to James E. Pizzuto, A. Scott Andres, John F. Wehmiller, and Daniel F. Belknap for their helpful reviews of the manuscript.

RADIOCARBON DATING

For studies of late Quaternary and Holocene climate, sea-level changes, and archaeological remains, radiocarbon dating has proved to be the most versatile and reliable dating technique. The basics of the dating technique are described by Bradley (1985) and summarized as follows. Because carbon is found worldwide and wherever organic remains are preserved, it has worldwide

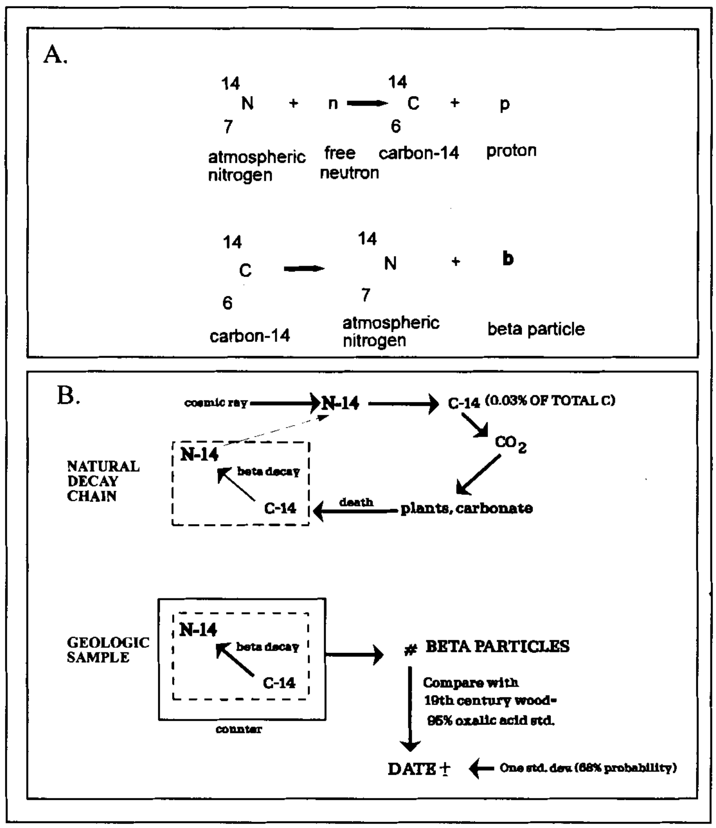

Figure 1. (A) Diagram of ^{14}C production
(B) Dating of ^{14}C-bearing material.

utility as a dating method. The technique was pioneered by Libby (1955) from his work on the isotopes of carbon, of which ^{14}C (carbon-14) forms the smallest percentage. ^{14}C is the product of cosmic radiation bombardment of ^{14}N (nitrogen-14) (Figure 1A) and is oxidized to carbon dioxide which mixes with the carbon dioxide of the rest of the atmosphere. Plants and animals take carbon dioxide into their systems during photosynthesis and respiration, respectively. Any carbonate-producing organisms such as clams or oysters also place ^{14}C within their shell structure. As soon as the organism dies, the intake of carbon dioxide stops, and because ^{14}C is unstable, it starts decaying into the more stable ^{14}N (Figure 1A). This decay produces beta particles (the result of the decay process) in a statistically predictable manner. In samples containing a large number of atoms, the activity of the decay and the number of beta particles emitted drops off exponentially with the age of the sample material. Over a period of 5730 years, one half of the ^{14}C atoms will have decayed (hence the half life of ^{14}C is 5730 years). Originally Libby (1955) had determined the half life to be 5568 years. Later, it was determined more accurately to be 5730 years. Because of the large number of dates that had been reported with the 5568 half life, a convention was worked out in which the laboratories would continue to report dates using the 5568 half life (Bradley, 1985).

One method for determining age based on the radiocarbon within a sample is to place the sample within a container that measures the beta particles that are emitted by the ^{14}C decay over a set period of time (Figure 1B). The counts are compared with those produced by laboratory standards, a date is calculated, and a one standard deviation age range is given. A sample of 40,000 years in age (the approximate upper limit of radiocarbon dating) will have so few ^{14}C atoms decaying and emitting beta particles that the sample is said to be dead to radiocarbon. Some recent techniques have increased the upper limits of the dating by placing the sample in an electron accelerator and directly measuring the ratios of the various isotopes of carbon. This technique takes longer and is about twice the cost of the conventional beta counting. Three dates in the Delaware radiocarbon database were generated by this method (Laboratory identification numbers beginning with AA, Appendix A).

CALIBRATION OF RADIOCARBON DATES

Although radiocarbon dating has proved to be a versatile and reliable dating technique, calculation of a radiocarbon age ". . . assumes that the specific activity of the carbon in atmospheric CO_2 has been constant" (Stuiver and Reimer, 1993). However, the carbon activity in the atmosphere, oceans, biosphere, and lithosphere has varied with time, which implies that the carbon activity in the samples being dated has varied as well. In order to compensate for this variance, the radiocarbon years are converted to calibrated years (cal. yrs.) (Stuiver and Reimer, 1993; Bard et al., 1993). Two methods of calibration frequently used are dendrochronology (tree ring) and ^{234}U-^{230}Th dating of corals. Tree-ring chronologies as far back as 11,000 years have been recognized and are used to verify and calibrate ^{14}C dates obtained from the wood cells of growth rings (Geyh and Schleicher, 1990; Stuiver and Pearson, 1993; Stuiver and Reimer, 1993; Stuiver et al., 1986). Precise U-Th ages as far back as approximately 20,000 ^{14}C yrs BP have been obtained on corals from Barbados and Mururoa by means of thermal ionization mass spectrometry; the resulting ^{14}C vs. U-Th curve can be used as a first-order ^{14}C calibration tool (Bard et al., 1993).

The program CALIB 3.0.3c (Stuiver and Reimer, 1993) has four data sets or calibration curves available for use for calibration. The data set selected depends on the type and age of the sample that was dated. Of the 231 ^{14}C dates in the radiocarbon database, 191 were converted to calibrated calendar years. The remaining 40 samples were considered too old to be calibrated by means of this program which has an upper limit of 18,000 ^{14}C years. Using the bidecadel atmospheric/inferred atmospheric curve (Dataset 1, Stuiver and Reimer, 1993), which uses a bidecadel tree ring dataset (AD 1955 - 9440 BC) and a marine ^{14}C data set for samples older than 10,000 ^{14}C yrs BP, calculations were made utilizing linear interpolation and probability distribution methods. Results from the probability distribution method were reported in 68.3% (1 sigma) and 95.4% (2 sigma) confidence intervals. The DGS radiocarbon database reports the 2 sigma confidence interval. Figure 2 is an example of how CALIB results are reported.

UNIVERSITY OF WASHINGTON
QUATERNARY ISOTOPE LAB
RADIOCARBON CALIBRATION PROGRAM REV 3.0.3C
Stuiver, M. and Reimer, P.J., 1993, Radiocarbon, 35, p. 215-230.

Calibration file(s): INTCAL93.14C
Listing file: c:\wp51\rccal.

I-5206

1
Ni31-25/GCR2DH-70/peat

Radiocarbon Age	BP 330 ± 90	Reference(s)
Calibrated age(s)	cal BP 425, 392, 319	(Stuiver and Pearson, 1993)

cal BP age ranges obtained from intercepts (Method A):

one Sigma**	cal BP 497-290
two Sigma**	525-264 212-141
	21-0

Summary of above:

minimum of cal age ranges (cal ages) maximum of cal age ranges:
1σ cal BP 497 (425, 392, 319) 290
2σ cal BP 525 (425, 392, 319) 0*

cal BP age ranges (cal ages as above)
from probability distribution (Method B):

% area enclosed	cal BP age ranges	relative contribution to 1σ or 2σ probabilities
68.3 (1σ)	cal BP 474-298	1.00
95.4 (2σ)	cal BP 529-262	.89
	216-138	.08
	24-0*	.03

Figure 2. Example of output from CALIB program (Stuiver and Reimer, 1993).

COMPILATION OF RADIOCARBON DATES

The data sets, upon which this database (Appendix A) is founded, are the compilations of Belknap (1975) and Kraft (1976a). Additional data were compiled from theses, dissertations, journal articles, and other sources. Some data were collected but never published and are reported here for the first time. Most of the reported dates come from samples collected in Delaware. A few are from outside of the state, either from federal waters offshore Delaware or from adjacent areas of Maryland or New Jersey, especially if included in Belknap (1975) or Kraft (1976a). Additional data not reported in Appendix A, including MASCA calibration dates (Ralph et al., 1973) reported by Kraft (1976a), are available as a part of the DGS Radiocarbon Database at the Delaware Geological Survey.

Where possible, the original data sources were consulted. Certain criteria were determined for acceptance of data into the database. First, the data had to be associated with a geographical site that could be determined within one second of latitude and longitude. Second, the data had to have some additional verification of their authenticity. Original data reports from the analytical laboratory were preferable. If these were not available, a compilation of the laboratory sample number, location data, and a description of the sample, and a log of the drill hole were acceptable. In a few instances, no core logs were available, but individual sample descriptions and sampling intervals were present and were deemed acceptable. A few reported dates had no laboratory identifiers but had other information. They were deemed acceptable if the supporting data (location, elevation, sample depth, etc.) were available.

All correlative data were compiled and placed in a spreadsheet. Once a sample location was verified, the core or drill hole was assigned a Delaware Geological Survey drill hole identifier, e.g., Qh44-01 (Talley and Windish, 1984). For samples obtained from outcrops, hand-driven cores, or soil augers, a DGS outcrop identifier, (e.g., Nh44-a) was assigned (Ramsey, 1994). A few dates were retained, even if location was uncertain, if originally included by Kraft (1976a). The locality identifiers (DGSID) are given as a geographic location such as "Assw. Canl." The original identifiers for the sample site are given as the local identifier (LOCALID). Elevation of the land surface of the sample site was determined as closely as possible. Except for sample sites for which elevations were surveyed in from a benchmark (indicated by elevation numbers to the second decimal place), some error is probable in the elevation reported (plus or minus half of the contour interval of the map from which the elevation was taken, that is, +/- 2.5 feet for maps with a 5-foot contour interval). Elevation of the sample itself is subject to the same uncertainty. The datum of the sample is given as that originally reported. Most are mean low water (MLW), but some are reported as mean sea level (MSL). No attempt has been made to correct elevations to a common datum.

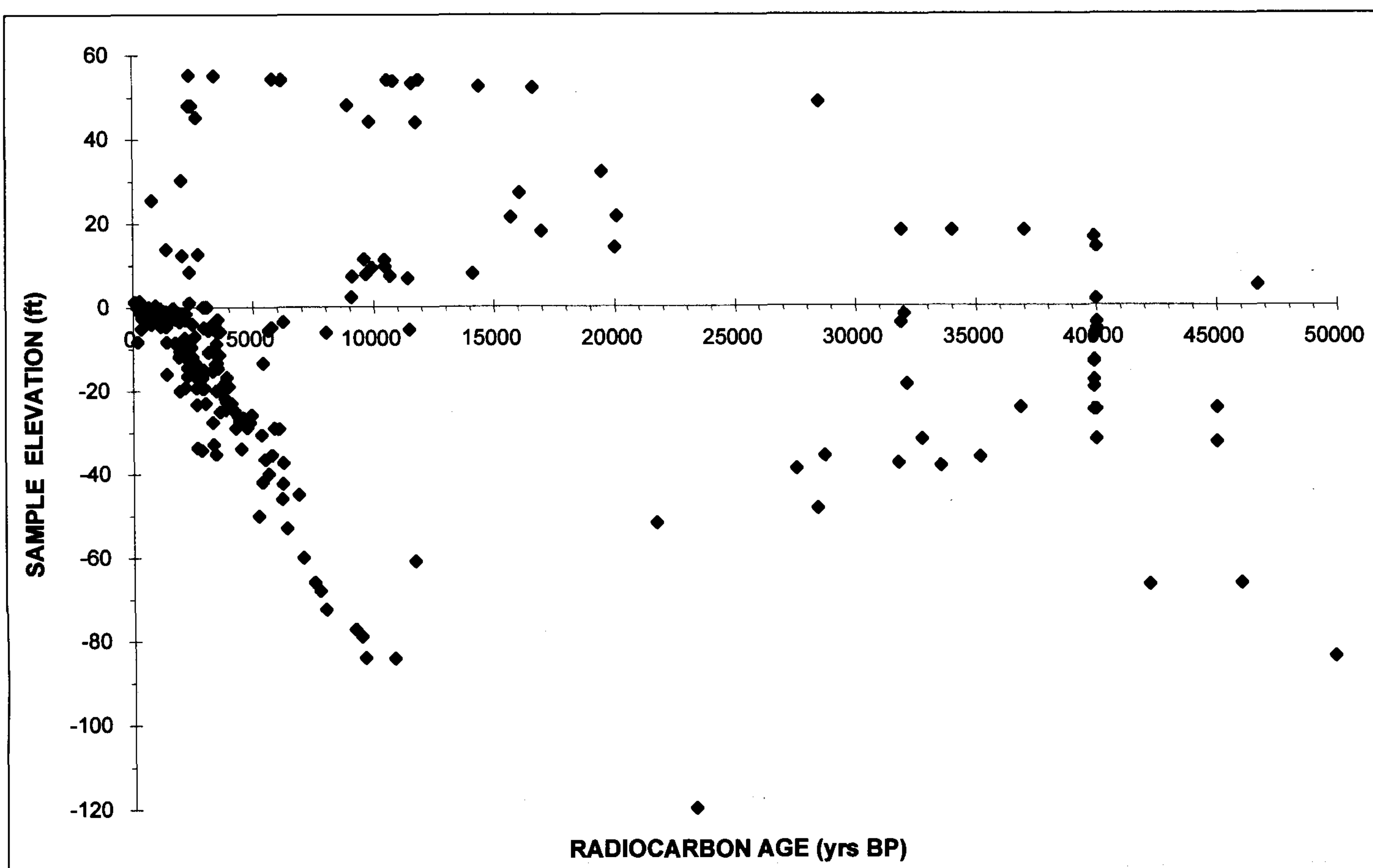

Figure 3. Plot of uncalibrated radiocarbon ages versus sample elevations.

The nature of the sample itself (peat, organic mud, etc.) is that reported in the original reference or on the laboratory sheets. No standardized format for description of the samples has been followed. Peat could be merely organic-rich sediment or it may be described as *Spartina* peat or could be a true peat. As much as possible, sample description has been verified by the original descriptions and standardized in the data tables for the purposes of useful data searches (e.g., searching for all the dates generated from shell material). Basal peat, because of its geological significance (Belknap and Kraft, 1977) is noted. Other samples verified as meeting the criteria for basal peat (Belknap, 1975; Belknap and Kraft, 1977) are listed as basal peat, if so listed by the data sources.

The original references from which the data were collected are given numerical identifiers (Appendix A) and are included in the references cited. For those data that were not previously published and that have been gleaned from a variety of sources, supplementary information is available from the Delaware Geological Survey Radiocarbon Database files. Each date has been given a reference number starting with 1. Each has a corresponding numbered file that contains all the supplemental information for the particular date including core and sample descriptions, originals or copies of the data sheets from the laboratories, and location maps. These files are available for inspection at the Delaware Geological Survey.

PLOT OF DATA VERSUS ELEVATION

Belknap and Kraft (1977) demonstrated the utility of plotting the radiocarbon dates versus sample elevations as an indicator of sea-level rise during the Holocene. In order to visualize the distribution of age versus sample elevation, all dates that have an associated sample elevation were plotted (Figure 3). The uncorrected radiocarbon dates (R. C. Date, Appendix A) were used because calibration methods were not applied to the entire age range of dates in the database. Four groups of dates are identified. The first are those between about -80 feet to present sea level and younger than 10,000 years. The second group are those found from about 10 to 60 feet above present sea level and are about 15,000 years and younger. The third group are those that occur less than 20 feet above present sea level and that range from 20,000 yrs BP to 10,000 yrs BP plus those below present sea level from about 10,000 to 5000 yrs BP where they merge with the first group. A fourth group includes those dates that are greater than 40,000 years old and are beyond the detection limit of radiocarbon. Some samples fall between -40 and -20 feet in elevation and between 20,000 and 38,000 BP. These probably belong to the group beyond the range of detection of radiocarbon that have been contaminated by modern carbon (Bradley, 1985, p. 54-57). Some of these dates or dates of similar ages from elsewhere along the Atlantic Coast have been used to support a mid-Wisconsinan high

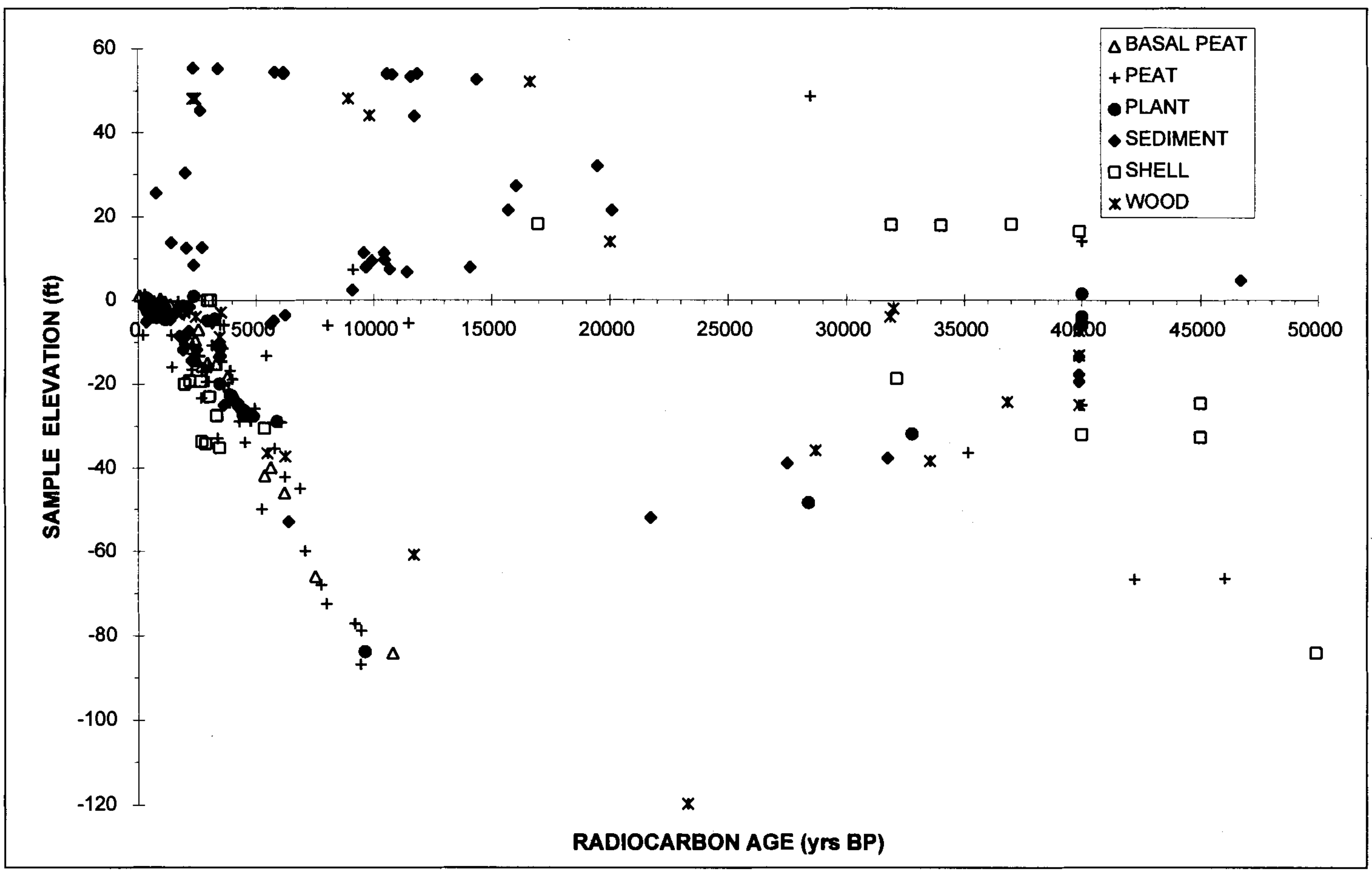

Figure 4. Plot of uncalibrated radiocarbon ages versus sample elevations, differentiated by sample type.

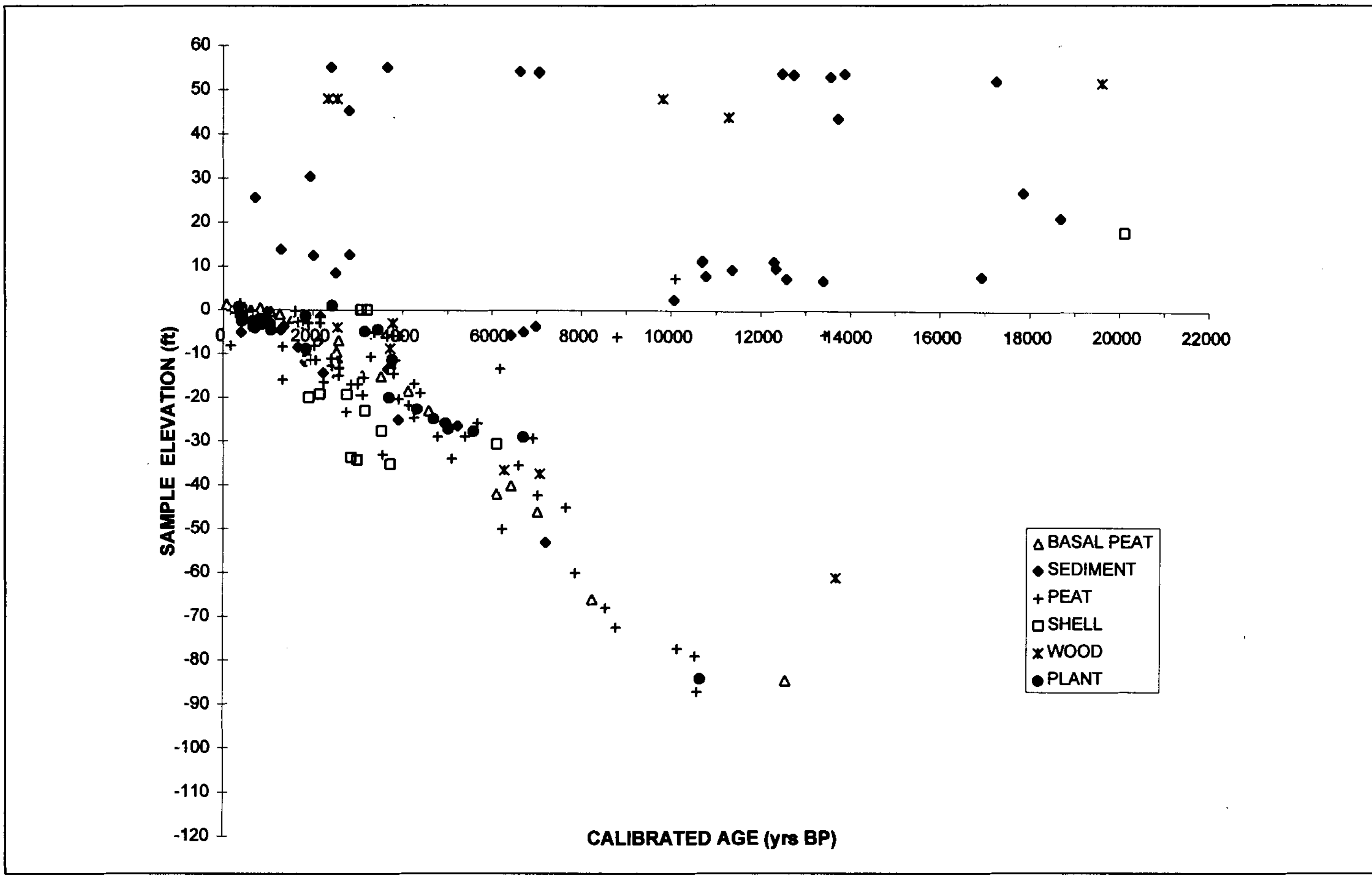

Figure 5. Plot of calibrated ages versus sample elevations, differentiated by sample type.

stand of sea level (Milliman and Emery, 1968). These dates are not assigned to a group because they neither relate to a single or related depositional regime (see below) nor do they fit the age criteria for being beyond the detection limits of radiocarbon. There are a few other scattered data points that do not fit into any of the groups.

A second plot (Figure 4) shows the same points shown in Figure 3 differentiated by sample type. Sample type was simplified from that recorded in Appendix A to six categories: basal peat, peat, plant, sediment, shell, and wood. Distribution of the sample types on the plot, especially for those dates associated with the Holocene rise of sea level (Figures 5, 6), indicates that sample type does not appear to influence the radiocarbon dates, except for dates reported from shell samples.

Shell samples from approximately 20 feet above present sea level and ranging from 17,000 to 37,000 radiocarbon years BP come from Qh41-a (Pepper Creek Ditch) in Sussex County. These shells have been dated by amino acid racemization to be greater than 120,000 years old (Groot et al., 1990). Contamination by younger carbon is indicated. Likewise, most of the dates from shell material that fall between -20 and -40 feet below sea level and 2,000 to 4,000 radiocarbon years BP plot in a cluster younger than all other samples tracking the rise of sea level. It is suspected that these also have been contaminated by younger carbon.

A third plot (Figure 5) shows the calibrated dates (younger than 20,000 years) versus sample elevation, differentiated by sample type. Note that the relative distribution of the plotted points and the groups are not affected by the calibration. These dates are in calibrated rather than radiocarbon years before present. Note the cluster of dates from shell material from -20 to -40 feet below sea level that plot younger than all of the other samples

Three depositional regimes were actively receiving organic-rich sediment from the latest Pleistocene into the Holocene and are represented by the three groups of radiocarbon dates (Figure 6). The first group is primarily an upland bog environment of undrained depressions (Webb, 1990) and some stream deposits (Demicco, 1982). These depressions, located mainly on upland surfaces above 40 feet in elevation, appear to have started accumulating sediment around 15,000 yrs BP and to have continued to the present. By about 2,500 yrs BP, sedimentation occurred in similar environments at lower elevations (Daniels, 1994). The second group represents non-tidal stream deposits beginning at about 15,000 yrs BP in the streams tributary to the main Delaware River drainage (Whallon, 1989; Pizzuto and Rogers, 1992; John and Pizzuto, 1995). The age of these deposits appears to be progressively younger with lower elevations. They intersect the third group of tidal-related deposits at about 4,000 yrs BP. The third group of dates came from organic-rich sediments that were deposited at or close to sea level in tidally-influenced environments (Belknap and Kraft, 1975; Fletcher et al., 1993) during the rise of sea level of the last 12,000 yrs.

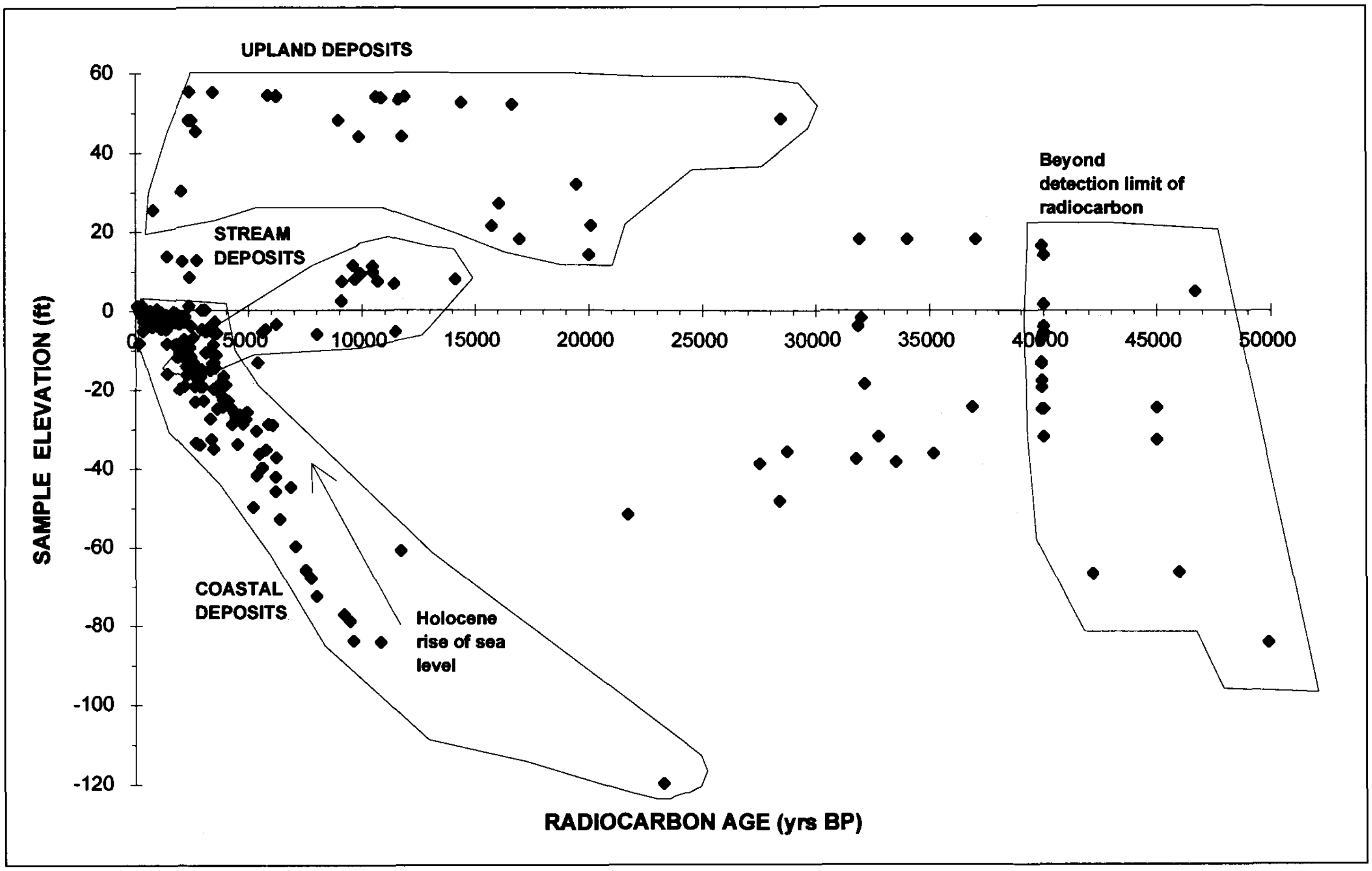

Figure 6. Plot of radiocarbon ages versus sample elevations showing depositional regimes.

ADDITIONS TO THE DATABASE

Other radiocarbon dates from Delaware of which the authors were not aware may exist. If the reader knows of any, please contact the authors or the Delaware Geological Survey and submit the reference containing the data, or, if unpublished, submit the data with all of the necessary supporting information. If at all possible, please include a copy of the data sheet that was sent from the radiocarbon lab. As new dates are reported, they will added to the database. As warranted, this publication will be reissued with the new data.

SUMMARY AND CONCLUSIONS

A total of 231 radiocarbon dates have been recorded in the Delaware Geological Survey Radiocarbon Database. Dates younger than about 20,000 years B. P. have been calibrated to account for atmospheric radiocarbon flux and have been reported as calibrated dates.

Plots of the dates versus elevation show four distinct groups of dates. Three groups of dates represent organic deposition in depressions and streams on the uplands, in non-tidal environments in the stream valleys tributary to the main Delaware River drainage, and in tidal environments associated with Holocene rise of sea level. A fourth group of dates represents those samples that contain carbon with ages beyond the detection limits of current radiocarbon techniques (>40,000 yrs. BP).

Sample type does not appear to have influenced the radiocarbon dates except for dates determined from shell material. Shell material appears to be commonly contaminated by younger carbon.

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Appendix A
Radiocarbon Database

All of the data were checked at least twice for correctness,
but as with any data compilation, the possibility of misprints or other errors still exists.

COLUMN HEADING	*EXPLANATION*
DGS #	Unique identifier for radiocarbon date in the DGS Radiocarbon Database
DGSID	Unique identifier for sample locality recorded in the Delaware Geological Survey Database
Latitude	North latitude. First two digits are degrees, second two are minutes, third two are seconds.
Longitude	West longitude. First two digits are degrees, second two are minutes, third two are seconds.
LOCALID	Unique identifier given in the original reference or sample site designation of the researcher.
Laboratory Id #	Laboratory number assigned by the radiocarbon laboratory
R.C. Date (5568)	Radiocarbon date reported by the radiocarbon laboratory (using 5,568 yrs half life).
+ or - (years)	Uncertainty range reported by the radiocarbon laboratory. A > symbol indicates that date in the R.C. Date column is a minimum age.
CALIB Range (yrs. BP)	Range of dates (BP- prior to 1950) in which the calibrated date falls for the 2-sigma probability range as calculated by the CALIB program (Stuiver and Reimer, 1993)
CALIB Date (yrs. BP)	Calibrated date taken as the mid-point of the 2-sigma calibrated range.
L.S.E. (ft)	Land surface elevation of sample site in feet.
E.T.S. (ft)	Elevation of the top of the sample interval from which the radiocarbon date was generated
Sample Datum	Datum from which the sample elevation was determined. MLW-mean low water; MSL-mean sea level; NGVD29-National Geodetic Vertical Datum of 1929; MHW-mean high water
Quad	USGS 7.5-minute quadrangle (Appendix B)
Samp. Type	Sample material used for dating
Reference Number	Reference from which data were compiled (Appendix A)

Other Abbreviations

org- organic
slt- silt
cl- clay
UNK- unknown
sed- sediment

Sp., spartina- *Spartina* (a marsh grass)
sp.- species
pal., palustr.- palustrine
Sc.- *Scirpus* (a marsh plant)
Merc.- *Mercenaria*
pea- peat

Appendix A (cont.)

Reference numbers (final column of database), author(s), and year of publication from which radiocarbon dates are cited. Complete references are given in the references cited section of this publication.

REFERENCE NUMBER	AUTHORS	YEAR
1	Kraft, J. C.	1976a
2	Belknap, D. F.	1975
3	Elliott, G. K.	1972
4	Strom, R. N.	1972
5	Kraft, J. C., and John, C. J.	1976
6	Kraft, J. C.	1976b
7	Halsey, S. D.	1978
8	Weil, C. B.	1976
9	Jordan, R. R.	1965
10	Delaware Geological Survey, unpublished data	
11	Belknap, D. F.	1979
12	McDonald, K. A.	1982
13	Whallon, E. E.	1989
14	Webb, R. S.	1990
15	Field, M. E.	1979
16	Marx, P. R.	1981
17	Maley, K. F.	1981
18	Demicco, P. M.	1982
19	Daniels, W. F.	1994
20	Pizzuto, J. E. and Rogers, E. W.	1992
21	Wehmiller, J. F., York, L. L., and Bart, M. L.	1995
22	Fletcher, C. H., Van Pelt, J. E., Brush, G. S., and Sherman, J.	1993
23	Kraft, J. C.	1977
24	Webb, R. S., Newby, P., and Webb, T.	1994
25	Rogers, E. W. and Pizzuto, J. E.	1994
26	John, S. J. and Pizzuto, J. E.	1995
27	Custer, J. F. and Griffith, D. R.	1984

DGS #	DGSID	Latitude	Longitude	LOCALID	Laboratory Id #	R.C. Date (5568)	+ or - (yrs.)	CALIB Range (yrs. BP)	CALIB Date (yrs. BP)	L.S.E. (ft.)	E.T.S. (ft.)	Sample Datum	Quad	Sample Type	Reference Number
1	Ni31-25	384722	750933	GCR 2DH-70	I-5206	330	90	529-262	396	8	-0.5	MLW	LEW	peat	1,2,3
2	Nj51-02	384520	750456	R-4104	R-4104	28400	1800			7.38	-48.5	MLW	CAH	plant	1,2
3	Nj51-02	384520	750456	R-4104	R-4104	190		177-170	174	7.38	-0.167	MLW	CAH	peat	1,2
4	Nj51-02	384520	750456	R-4104	R-4104	1950	200	2342-1487	1915	7.38	-20	MLW	CAH	shell	1,2
5	Nj51-02	384520	750456	R-4104	R-4104	3010	180	3567-2769	3168	7.38	-23	MLW	CAH	shell	1,2
6	Ni35-03	384705	750540	R-4103	R-4103	7050	220	8209-7511	7860	5.4	-60	MLW	CAH	peat	1,2
7	Oj51-02	384010	750412	R-4100	R-4100	350	130	553-127	340	1.5	0.6	MLW	REB	plant	1,2
8	Oj51-02	384010	750412	R-4100	R-4100	2180	150	2505-1811	2158	1.5	-19.2	MLW	REB	shell	1,2
9	Oj51-02	384010	750412	R-4100	R-4100	4860	180	5951-5212	5582	1.5	-27.7	MLW	REB	plant	1,2
10	Oj51-02	384010	750412	R-4100	R-4100	5860	340	7378-5988	6683	1.5	-29	MLW	REB	plant	1,2
11	Oj51-01	384010	750406	R-4101	R-4101	250	140	491-52	272	1.5	-0.7	MLW	REB	peat	1,2
12	Oj51-01	384010	750406	R-4101	R-4101	2630	190	3215-2306	2761	1.5	-19.3	MLW	REB	shell	1,2
13	Oj51-01	384010	750406	R-4101	R-4101	5470	200	6679-5885	6282	1.5	-36.6	MLW	REB	wood	1,2
14	Oj51-01	384010	750406	R-4101	R-4101	6190	190	7399-6633	7016	1.5	-42.3	MLW	REB	peat	1,2
15	Pj21-03	383841	750420	R-4114	R-4114	3520	160	4160-3445	3803	2.4	-14.6	MLW	REB	peat&plant	1,2
16	Pj21-03	383841	750420	R-4114	R-4114	3890	170	4658-3867	4263	2.4	-16.8	MLW	REB	peat&plant	1,2
17	Pj21-03	383841	750420	R-4114	R-4114	3780	170	4574-3688	4131	2.4	-18.4	MLW	REB	basal peat	1,2
18	Pj21-02	383813	750410	R-4113	R-4113	3130	170	3694-2874	3284	2.47	-10.8	MLW	REB	peat	1,2
19	Pj21-01	383842	750346	R-4110	R-4110	510		536-516	526	5.17	-1.8	MLW	REB	peat&plant	1,2
20	Pj22-01	383841	750359	R-4111	R-4111	2870	160	3409-2716	3063	6.82	-19.4	MLW	REB	peat	1,2
21	Pj22-01	383841	750359	R-4111	R-4111	2960	180	3483-2748	3116	6.82	-19.4	MLW	REB	peat	1,2
22	Pj22-02	383841	750354	R-4112	R-4112	2660	530	4005-1507	2756	6.57	-23.3	MLW	REB	peat	1,2
23	Pj42-11	383632	750344	R-4115	R-4115	3430	170	4147-3325	3736	6.66	-35.3	MLW	BEB	shell	1,2
24	Pj42-11	383632	750344	R-4115	R-4115	10800	300	13412-11710	12561	6.66	-84.3	MLW	BEB	basal peat	1,2
25	Pi51-01	383550	750926	JCK 16-67	GEOCHRO	2060	110	2323-1804	2064	-5	-11.5	MLW	FRA	peat	1,2
26	Ni45-a	384636	750506	CAH light site	1-3964	270	90	501-243	372	0.5	0.5	MLW	CAH	wood	1,2
27	Nh23-06	384807	751216	RSE-5-69	1-4353	1990	100	2155-1697	1926	5	-9	MLW	LEW	peat	1,2,3
28	Nh35-20	384758	751054	GKE 3-70	1-5208	2420	95	2748-2308	2528	4	-9.6	MLW	LEW	basal peat	1,2,3
29	Nh35-21	384752	751020	DH 2-69	1-4626	39900	>			5	-13.5	MLW	LEW	mud	1,2,3
30	Nh35-21	384752	751020	DH 2-69	1-4627	39900	>			5	-17.8	MLW	LEW	mud	1,2,3
31	Nh35-21	384752	751020	DH 2-69	1-4628	39900	>			5	-19.5	MLW	LEW	mud	1,2,3
32	Nh45-21	384653	751027	GKE 1-70	I-4799	2580	95	2808-2360	2584	4	-13.3	MLW	LEW	peat	1,2,3
33	Nh45-22	384641	751025	TMS 10-69	I-4625	2330	100	2717-2119	2418	4	-12.8	MLW	LEW	peat	1,2,3
34	Mg25-01	385309	751554	3 strom-70	I-5205	2560	95	2795-2354	2575	-5	-7	MLW	MIR	basal peat	1,2,4
35	Jj41-a	391106	750442	Skimmer 5-70	1-52-3	2260	95	2481-1992	2237	-16.5	-16.5	MLW	PNS	peat	1,2
36	Kf23-07	390347	752236	JCK 7-69	1-4624	2550	100	2795-2350	2573	-5	-15	MLW	BEP	peat	1,2,6

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37	Kf32-05	390259	752330	RSE 12-69	I-4388	1935	100	2120-1684	1902	3	-3.5	MLW	FRE	peat	1,2
38	Kf32-07	390254	752318	JCK core 11-69	P-1669	2153	69	2325-1982	2154	3	-3	MLW	FRE	peat	1,2
39	Kf22-39	390303	752338	JCK-DH 5-69	P-1685	3314	63	3651-3392	3522	3	-15.2	MLW	FRE	basal peat	1,2,5
40	Kf22-26	390307	752325	JCK-DH 1-69	P-1686	1950	55	1994-1736	1865	3	-10.5	MLW	FRE	peat	1,2,5
41	Kf32-04	390255	752318	JCK-core 1-68	P-1687	1952	45	1991-1804	1898	3	-3	MLW	FRE	peat	1,2,5
42	Kf22-26	390307	752325	JCK-DH1-69	P-1688	2999	59	3279-2993	3136	3	-15.5	MLW	FRE	peat	1,2,5
43	Qj22-08	383330	750335	GCR 8DH-70	I-5207	39900	>			2	-25	MLW	BEB	wood	1,2,5
44	Pj24-01	383855	750115	9-70E	I-5204	7500	135	8495-7990	8243	2	-66	MLW	REB	basal peat	1,2,5
45	Kf22-04	390320	752340	DH 2-71	I-5950	3360	95	3740-3385	3563	7	-33	MLW	BEP	peat	1,2
46	Kf22-04	390320	752340	DH 2-71	I-5927	5205	110	6269-6238	6234	7	-50	MLW	BEP	peat	1,2
47	Kf22-04	390320	752340	DH 2-71	I-5994	7730	125	8764-8302	8533	7	-68	MLW	BEP	peat	1,2
48	Kf22-06	390324	752345	DH 3-71	I-5928	9435	155	10937-10131	10534	5	-79	MLW	FRE	peat	1,2
49	If51-01	391036	752430	DH 8-71	I-5929	2945	95	3344-2863	3104	6.3	-15	MLW	LTC	basal peat	1,2
50	Lg52-15	385518	751845	DH 11-71	I-5930	5345	110	6317-5903	6110	3	-42	MLW	MIR	basal peat	1,2
51	Jg31-03	390730	751915	no. 29-w-71	I-5955	4090	100	4842-4350	4596	-21	-23	MLW	BEP	basal peat	1,2
52	Hg55-01	391521	751530	no. 56-w-71	I-5984	3980	105	4654-4142	4398	-17	-19	MLW	BDP	peat	1,2
53	Fc15-03	392942	753518	JCK-DH-3-72	I-6575	2685	90	3000-2701	2851	0	-17	MLW	TAB	peat	1,2,5
54	Fc15-03	392942	753518	JCK-DH-3-72	I-6576	4515	100	5331-4867	5099	0	-34	MLW	TAB	peat	1,2,5
55	Fc15-03	392942	753518	JCK-DH-3-72	I-6577	5600	110	6665-6183	6424	0	-40	MLW	TAB	basal peat	1,2,5
56	Ed22-10	393334	753306	JCK-DH1-72	I-6587	1410	90	1515-1136	1326	8	-16	MLW	DEC	peat	1,2,5
57	Ed22-10	393334	753306	JCK-DH1-72	I-6588	4265	95	5052-4522	4787	8	-29	MLW	DEC	peat	1,2,5
58	He11-01	391912	752900	JCK-DH-2-72	I-6589	6835	115	7836-7471	7654	8	-45	MLW	BBH	peat	1,2,5
59	A.Isl. Md.	381412	750800	SDH 4-71	I-6597	32750	1650			5	-32	MLW	?	plant&wood	1,2,7
60	Be32-05	394700	752818	JCK-DH 1-HO	I-7035	31850	1300			8	-4	MLW	MAH	wood	1,2,5
61	Be42-07	394659	752819	JCK-DH-2-73	I-7036	2355	85	2553-2285	2419	8	1	MLW	MAH	plant	1,2,5
62	Be42-07	394659	752819	JCK-DH-2-73	I-7038	2450	85	2736-2345	2541	8	-4	MLW	MAH	wood	1,2,5
63	Be42-08	394654	752830	JCK-DH 1-74ho	I-7799	40000	>			8	1.5	MLW	MAH	plant	1,2,5,23
64	Be32-04	394700	752818	JCK-DH 2-74ho	I-7801	40000	>			8	-4	MLW	MAH	plant	1,2,5,23
65	Be32-04	394700	752818	JCK-DH 2-74ho	I-7802	40000	>			8	-5.5	MLW	MAH	plant	1,2,5,23
66	Be32-04	394700	752818	JCK-DH 2-74ho	I-7800	40000	>			8	-6	MLW	MAH	plant	1,2,5,23
67	Fc31-40	392706	753918	JCK-DH 3-APM	I-7037	6170	115	7266-6777	7022	3	-46	MLW	MID	basal peat	1,2,5,23
68	Mi45-01	385109	750536	CBW-10E71	I-6947	9580	145	10996-10300	10648	-72	-84	MLW	CAH	plant	1,2,8
69	Kg45-01	390145	751524	CBW-26E71	I-6948	40000	>			-29	-32	MLW	BEP	shell	1,2,8
70	Jh25-01	390512	751342	PC30-71	I-6674	2685	90	3000-2701	2851	-32	-33.7	MLW	MMS	shell	1,2,8
71	Jh25-01	390512	751342	PC30-71	I-6675	2855	90	3211-2774	2993	-32	-34.3	MLW	MMS	shell	1,2,8
72	Chinco.V	375700	752100	SDH 33-1972 CI	I-6885	28700	850			5	-36	MLW	?	wood	1,2,7

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73	Qh41-a	383137	751448	JCK RSE outcrop	I-6052	16970	290	20923-19287	20105	25	18	MLW	FRA	shell	1,2
74	Qh41-a	383137	751448	RRJ INQUA VII	I-749	34000	2000			25	18	MLW	FRA	shell	1,2,9
75	Qh41-a	383137	751448	RRJ INQUA VII	I-819	37000	>			25	18	MLW	FRA	shell	1,2,9
76	Qh41-a	383137	751448	JCK CLS -73	I-7524	31900	1400			25	18	MLW	FRA	shell	1,2
77	Qh44-01	383054	751130	QH44-1	I-747	32000	>			22	-2	MLW	FRA	wood	1,2,10
78	Qh44-01	383054	751130	QH44-1	I-748	20000				22	14	MLW	FRA	wood	1,2,10
79	Pj42-02	383628	750347	PJ42-2	I-854	23300	850			6.4	-120	MLW	BEB	wood	1,2,10
80	Qc23-01	383345	753705	QC23-1	I-4155	39900	>			20	-13.2	MLW	LAU	wood	1,2,10
81	Pc41-01	383619	753954	PC41-1	I-4157	39900	>			22.6	-7.4	MLW	SHA	wood	1,2,10
82	Pc25-04	383834	753548	PC25-4	I-4156	39900	>			25.66	16.4	MLW	SEE	shell	1,2,10
83	Fb45-07	392604	754059	Noxontown	I-7525	2875	90	3218-2780	2999	3	-17	MLW	MID	peat	1,2,23
84	Assw.Can	383238	750536	CLS DH4-73	I-7526	40000	>			10	-25	MLW	FRA	peat&plant	1,2
85	Kc21-a	390312	754000	JCK DF RC 1	I-6884	8930	125	10088-3540	9814	50	48	MLW	MAR	wood	1,2
86	Kc21-a	390312	754000	JCK DF RC 2	I-6886	2330	85	2547-2135	2341	50	48	MLW	MAR	wood	1,2
87	Kc21-a	390312	754000	JCK DF RC 3	I-6891	2450	85	2736-2345	2541	50	48	MLW	MAR	wood	1,2
88	Oi53-a	384012	750748	DFB 2b-74	I-8118	690	85	757-524	641	-1	-1.1	MLW	FAI	basal peat	1,2
89	Ni55-e	384536	750600	DFB 3-74	I-8119	920	90	964-671	818	2	-2.4	MLW	CAH	basal peat	1,2
90	Lg41-22	385534	751920	KAYAN 5	I-9228	1690	85	1804-1402	1603	3	-0.281	MSL	MIR	peat	1
91	Lg51-05	385545	751908	KAYAN 3	I-9229	285	75	505-253	379	3	1.458	MSL	MIR	peat	1
92	Mg13-08	385417	751747	KAYAN 2	I-9230	720	80	784-540	662	3	-2.580	MSL	MIR	peat	1
93	Lg52-08	385519	751842	KAYAN 10	I-9418	4585	95	5484-4980	5232	3	-26.528	MSL	MIR	peat&mud	1
94	Lg52-08	385519	751842	KAYAN 10	DFB-40	5330	95	6293-5923	6108	3	-30.62	MSL	MIR	shell	1,10
95	Mf34-01	385235	752137	KAYAN 11	I-9447	195	90	328-0	164	0.5	-8.227	MSL	MIR	peat	1
96	Qj42-09	383159	750317	KAM-CL-80	Beta 18-32	31750	860			6	-37.7		BEB	organic silt	12
97	Qj22-06	383334	750331	KAM-NOV-80	TEM-204	45000	>			5	-24.6		BEB	shell hash	12
98	Qj42-07	383132	750315	KAM-MB-80	TEM-205	45000	>			10	-32.8		BEB	shell hash	12
99	Nh35-a	384750	751051	BR		345	85	530-270	400	1.5	0		LEW	shell	10
100	Hc25-08	391813	753555	DC-1		11480	150	13780-13073	13427	1	-5.56	MLW	SMY	peat	13,25
101	Hc25-10	391806	753554	DC-3		5620	70	6559-6287	6423	1	-5.69	MLW	SMY	sandy mud	13,25
102	Hc25-10	391806	753554	DC-3		5750	60	6710-6690	6700	1	-4.91	MLW	SMY	sandy mud	13,25
103	Hc25-10	391806	753554	DC-3		1370	110	1512-1057	1285	1	-4.64	MLW	SMY	muddy peat	13,25
104	Jd35-14	390738	753001	SJ-1		1890	220	2325-1357	1841	1	-8.84	MLW	LTC	fiber mat	13,25
105	Je31-33	390738	752956	SJ-3		1920	40	1936-1737	1837	2	-9.02	MLW	LTC	mud	13,25
106	Je31-33	390738	752956	SJ-3		1360	100	1057-1019	1038	2	-3.12	MLW	LTC	mud	13,25
107	Je31-33	390738	752956	SJ-3		1040	220	1333-3543	984	2	-0.49	MLW	LTC	mud	13,25
108	Je31-23	390747	752953	SJ-6		3460	80	3898-3543	3721	2	-8.82	MLW	LTC	wood	13,25

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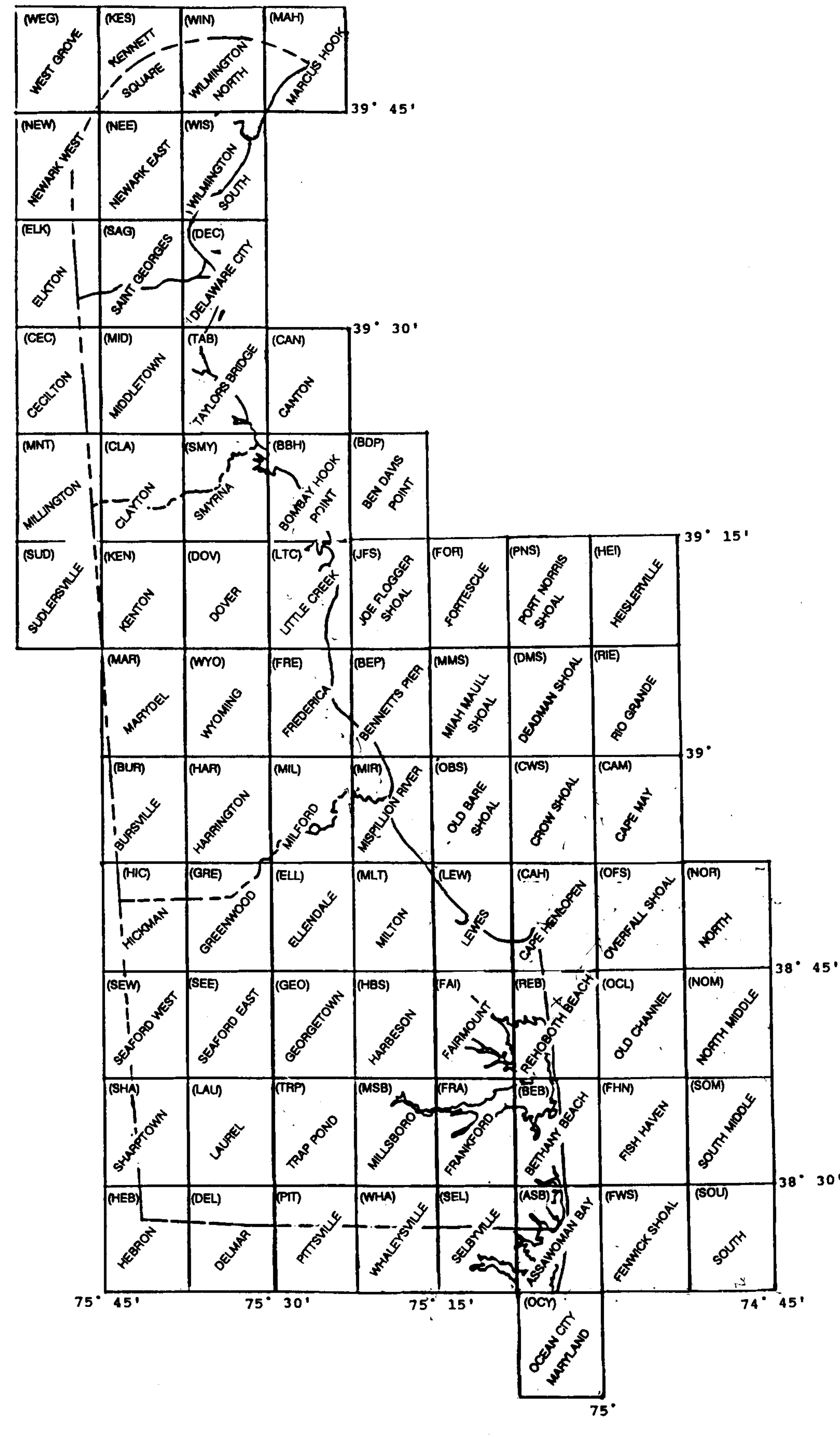
109	Ic15-19	391438	753502	LR-1		6230	270	7452-6496	6974	2	-3.64	MLW	DOV	sandy mud	13,25
110	Ic15-22	391435	753501	LR-4		3515	85	3989-3568	3779	2	-2.99	MLW	DOV	wood	13,25
111	Ic15-23	391436	753502	LR-5		8020	100	9056-8551	8804	1	-6.12	MLW	DOV	peat	13,25
112	Pl41-01	383633	755414	DGS9214	BETA-67541	7970	80	8991-8551	8771	-72.5	-72.5	MSL	FHN	peat	10
113	Pl41-01	383633	755414	DGS9214	BETA-67542	9170	80	10304-9983	10144	-72.5	-77.3	MSL	FHN	peat	10
114	Qk43-01	383104	745700	DGS9210	BETA-67543	46000	>			-56	-66.5	MSL	FHN	peat	10
115	Qk43-01	383104	745700	DGS9210	BETA-67544	42200	>			-56	-66.8	MSL	FHN	peat	10
116	Jb33-a	390740	754213	Tappahanna	I-9525	28480	880			57	48.5	MSL	KEN	peat	10
117	Id42-b	391144	753345	Terry Campus	I-11,899	40000	>			19	14	MSL	DOV	peat	10
118	Gc54-al	392024	753650	Prison Pond	WIS-2022	2650	80	2899-2701	2800	46	45.21	NGVD29	SMY	org slt/cl	14,24
119	Gc54-al	392024	753650	Prison Pond	WIS-2023	11760	150	14126-13347	13737	46	43.88	NGVD29	SMY	slt/cl	14,24
120	Gb25-b2	392305	754030	Longhauser	WIS-2007	3410	80	3844-3465	3655	56	55.02	NGVD29	MID	org slt/cl	14,24
121	Gb25-b2	392305	754030	Longhauser	WIS-2008	6190	90	7236-6857	7047	56	53.90	NGVD29	MID	org lake mud	14,24
122	Gb25-b2	392305	754030	Longhauser	WIS-2009	10820	100	12962-12515	12739	56	53.67	NGVD29	MID	fine slt/cl	14,24
123	Gb25-b2	392305	754030	Longhauser	WIS-2010	11610	100	13840-13285	13563	56	53.18	NGVD29	MID	fine slt/cl	14,24
124	Gb25-al	392309	754040	Nowakowski	WIS-2007	6190	100	7262-6852	7057	56	54.13	NGVD29	MID	org lake mud	14,24
125	Gb25-al	392309	754040	Nowakowski	WIS-2008	10580	100	12745-12210	12478	56	53.90	NGVD29	MID	fine slt/sd	14,24
126	Gb35-a2	392253	754040	Walter's Puddle	WIS-2024	2370	150	2756-2047	2402	56	55.18	NGVD29	MID	org cl/slt	14,24
127	Gb35-al	392253	754040	Walter's Puddle	WIS-1802	5820	80	6794-6442	6618	56	54.29	NGVD29	MID	org lake mud	14,24
128	Gb35-al	392253	754040	Walter's Puddle	WIS-1803	11880	160	14306-13450	13878	56	53.93	NGVD29	MID	fine slt/sd	14,24
129	Gb35-al	392253	754040	Walter's Puddle	WIS-1804	14400	150	17628-16875	17252	56	52.42	NGVD29	MID	UNK	14,24
130	Rj33-01	382707	750201	CORE13	I-7441	5761	105	6785-6389	6587	-29.9	-35.5		ASB	peat	15
131	Ti24-01	381806	750602	CORE51	I-7438	32730	1650			-24.9	-32		OCY	peat	15
132	Lg51-01	385554	751903	PRM-4	TEM-172	2020	110	2201-1715	1958	0	-11.5	MLW	MIR	peat	16
133	If51-02	391047	752410	PRM-2	TEM-173	2490	80	2739-2359	2549	0	-14.4	MLW	LTC	basal peat	16
134	Mh41-07	385108	751415	KM-11	TEM-150	3580	100	4091-3572	3832	-1	-11.5		LEW	peat	17
135	Kb45-a	390115	754017	D56-1		16640	260	19829-19382	19606	55	52	MSL	MAR	wood	18
136	Od52-i	384029	753323	SITE9	Beta-71200	9110	70	10217-9954	10086	5	7.22		SEE	peat	10
137	Od52-g2	384032	753318	S7-1	Beta-71201	9090	80	10214-9921	10068	8	2.3		SEE	organic sed	10
138	Od52-I8	384027	753309	17D	Beta-71202	9680	90	10998-10539	10769	3	7.8		SEE	organic sed	10
139	Id42-16	391115	753342	PC-3	Beta-53518	2020	100	2159-1717	1938	31.8	30.3	MSL	DOV	sediment	19
140	Id42-16	391115	753342	PC-3	Beta-53941	16060	260	19577-18420	17841	31.8	27.1	MSL	DOV	sediment	19
141	Id42-16	391115	753342	PC-3	Beta-54093	20090	390			31.8	21.5	MSL	DOV	sediment	19
142	Id42-15	391129	753335	PC-7	Beta-53521	46700	>			15.1	4.8	MSL	DOV	sediment	19
143	Id42-17	391129	753335	PC-10	Beta-54094	2720	60	2898-2748	2823	14.4	12.6	MSL	DOV	sediment	19
144	Id42-17	391129	753335	PC-10	Beta-54095	9600	90	10966-10427	10697	14.4	11.3	MSL	DOV	sediment	19

DGS #	DGSID	Latitude	Longitude	LOCALID	Laboratory Id #	R.C. Date (5568)	+ or - (yrs.)	CALIB Range (yrs. BP)	CALIB Date (yrs. BP)	L.S.E. (ft.)	E.T.S. (ft.)	Sample Datum	Quad	Sample Type	Reference Number
145	Id42-20	391132	753332	PC-11	Beta-54096	14120	190	17397-16447	16922	15.8	7.8	MSL	DOV	sediment	19
146	Id42-19	391130	753332	PC-14	Beta-54097	1410	70	1419-1168	1294	15.1	13.8	MSL	DOV	sediment	19
147	Id42-19	391130	753332	PC-14	Beta-54098	2070	60	2151-1875	2013	15.1	12.4	MSL	DOV	sediment	19
148	Id42-19	391130	753332	PC-14	Beta-54099	10450	100	12627-11965	12296	15.1	11.2	MSL	DOV	sediment	19
149	Id42-19	391130	753332	PC-14	Beta-54100	10470	90	12626-12049	12338	15.1	9.6	MSL	DOV	sediment	19
150	Id42-19	391130	753332	PC-14	Beta-54101	11420	350	14160-12648	13404	15.1	6.7	MSL	DOV	sediment	19
151	Id42-18	391130	753333	PC-15	Beta-54102	9930	80	11746-10975	11361	15.8	9.3	MSL	DOV	sediment	19
152	Id42-18	391130	753333	PC-15	Beta-54103	10680	140	12909-12248	12579	15.8	7.3	MSL	DOV	sediment	19
153	Ni55-a	384540	750545	WC-LCM-4-79	TEM-157	940	120	1069-656	863	1	-3.3	MSL	CAH	spartina sp.	10
154	Ni55-b	384550	750550	WC-LCM-8-79	TEM-158	280	60	485-265	375	1	-1.3	MSL	CAH	spartina sp.	10
155	Ni55-b	384550	750550	WC-LCM-10-79	TEM-159	370	80	535-281	408	1	-2.6	MSL	CAH	spartina sp.	10
156	Ni55-b	384550	750550	WC-LCM-11-79	TEM-160	1150	80	1199-929	1064	1	-4.6	MSL	CAH	spartina sp.	10
157	Ni55-b	384550	750550	WC-LCM-12-79	TEM-161	1100	90	1188-881	1035	1	-3.1	MSL	CAH	spartina sp.	10
158	Ni55-c	384551	750551	WC-LCM-13-79	TEM-162	930	90	973-672	823	1	-2	MSL	CAH	spartina sp.	10
159	Ni55-c	384551	750551	WC-LCM-15-79	TEM-163	750	70	790-550	670	1	-3.9	MSL	CAH	spartina sp.	10
160	Ni55-d	384555	750555	WC-LCM-16-79	TEM-164	690	100	791-509	650	1	-2.6	MSL	CAH	spartina sp.	10
161	Ni44-a	384605	750620	WC-LCM-21-79	TEM-165	760	70	792-620	706	1	-4.1	MSL	CAH	spartina sp.	10
162	Ni44-a	384605	750620	WC-LCM-22-79	TEM-166	980	120	1095-667	881	1	-2.4	MSL	CAH	spartina sp.	10
163	Jf21-a	390811	752409	Pickering Offshr	TEM-148	3450	100	3931-3465	3698	-4	-20	MSL	LTC	tree stump	10
164	Ni54-b	384520	750701	WG-5A	GX-16213	4380	235	5592-4403	4998	3	-26.2	MLW	CAH	pal. marsh pea	22
165	Ni53-a	384510	750709	WG-10	GX-16214	1775	150	1999-1346	1673	3	-2.85	MLW	CAH	pal. marsh pea	22
166	Ni53-a	384510	750709	WG-10	GX-16215	2945	190	3568-2729	3149	3	-4.9	MLW	CAH	spartina paten	22
167	Ni53-a	384510	750709	WG-10	GX-16217	3130	200	3732-2846	3289	3	-5.53	MLW	CAH	pal marsh peat	22
168	Ni53-a	384510	750709	WG-10	GX-16216	3195	200	3856-2879	3368	3	-5.2	MLW	CAH	pal marsh peat	22
169	Ni53-a	384510	750709	WG-10	GX-16218	3465	185	4242-3329	3786	3	-5.83	MLW	CAH	pal marsh peat	22
170	Ni53-a	384510	750709	WG-10	GX-16219	3620	215	4452-3398	3925	3	-5.9	MLW	CAH	pal marsh peat	22
171	Ni53-b	384514	750713	WG-11	GX-16221	1885	170	2158-1408	1783	3	-2.57	MLW	CAH	pal marsh peat	22
172	Ni53-b	384514	750713	WG-11	GX-16220	1910	245	2367-1294	1831	3	-1.4	MLW	CAH	spartina alt.	22
173	Ni53-b	384514	750713	WG-11	GX-16222	3250	175	3884-2997	3441	3	-4.48	MLW	CAH	spartina paten	22
174	Ni54-c	384517	750658	WG-12	GX-16223	3460	205	4287-3245	3766	3	-11.3	MLW	CAH	spartina paten	22
175	Ni54-c	384517	750658	WG-12	GX-16224	4745	245	5956-4832	5394	3	-28.9	MLW	CAH	marsh peat	22
176	Ni54-a	384522	750701	WG-5	GX-15829	3630	40	3995-3832	3914	3	-20.3	MLW	CAH	palustr. marsh	22
177	Ni54-a	384522	750701	WG-5	GX-15830	3870	200	4828-3824	4326	3	-22.6	MLW	CAH	spartina paten	22
178	Ni54-a	384522	750701	WG-5	GX-15831	3860	175	4656-3828	4262	3	-24.6	MLW	CAH	palustr. marsh	22
179	Ni54-a	384522	750701	WG-5	GX-15832	4930	80	5778-5570	5674	3	-25.9	MLW	CAH	palustr. marsh	22
180	Ni54-a	384522	750701	WG-5	GX-15833	4420	170	5471-4564	5018	3	-27.2	MLW	CAH	spartina paten	22

DGS #	DGSID	Latitude	Longitude	LOCALID	Laboratory Id #	R.C. Date (5568)	+ or - (yrs.)	CALIB Range (yrs. BP)	CALIB Date (yrs. BP)	L.S.E. (ft.)	E.T.S. (ft.)	Sample Datum	Quad	Sample Type	Reference Number
181	Ni54-a	384522	750701	WG-5	GX-15834	6050	100	7099-6711	6905	3	-29.2	MLW	CAH	palustr. marsh	22
182	Ni54-d	384515	750656	WG-6	GX-15835	2095	205	2503-1564	2034	3	-8.2	MLW	CAH	palustr. marsh	22
183	Ni54-d	384515	750656	WG-6	GX-15836	3805	170	4579-3698	4139	3	-21.7	MLW	CAH	palustr. marsh	22
184	Ni54-d	384515	750656	WG-6	GX-15837	4210	85	4878-4512	4695	3	-24.9	MLW	CAH	Juncus gerardi	22
185	Ni54-d	384515	750656	WG-6	GX-15838	4350	85	5093-4815	4954	3	-25.9	MLW	CAH	Sp. cyno, Sc. r	22
186	Nh35-b	384710	751019	Z1	Beta-14681	80	60	149-9	79	4.2	1.2	MLW	LEW	basal peat	10
187	Nh35-c	384709	751018	Z2	Beta-14682	950	90	991-674	833	4.2	0.4	MLW	LEW	basal peat	10
188	Nh35-d	384708	751017	Z3	Beta-14683	670	70	707-535	621	4.2	-0.1	MLW	LEW	basal peat	10
189	Nh35-e	384707	751017	Z4	Beta-14684	930	80	961-683	822	4.2	-0.7	MLW	LEW	basal peat	10
190	Nh35-f	384707	751016	Z5	Beta-14685	1150	80	1199-929	1064	4.2	-0.4	MLW	LEW	basal peat	10
191	Nh35-g	384706	751015	Z6	Beta-14686	1370	60	1360-1164	1262	4.2	-1	MLW	LEW	basal peat	10
192	Nh35-h	384705	751014	Z7	Beta-14687	1650	70	1706-1387	1547	4.2	-1.9	MLW	LEW	basal peat	10
193	Nj31-01	384700	750442	A3	Beta-5154	6360	140	7473-6925	7199	-32	-53	MSL	CAH	marsh mud	10
194	Nj31-01	384700	750442	A3	Beta-5155	11710	190	14146-13225	13686	-32	-61	MSL	CAH	wood	10
195	Nj51-05	384536	750400	B3	Beta-5156	21710	200			-30	-52	MSL	CAH	organic mud	10
196	Pj12-03	383945	750330	E2	Beta-5157	3310	90	3725-3352	3539	-23	-27.6	MSL	REB	shell	10
197	Pj12-04	383945	750300	E3	Beta-5158	6220	90	7268-6885	7077	-30	-37.4	MSL	REB	wood	10
198	Qj12-01	383430	750330	H1	Beta-5159	32110	550			-12	-18.7	MSL	BEB	shell hash	10
199	Qj13-04	383430	750212	H3	Beta-5162	27510	>			-32	-39	MSL	BEB	total org carbo	10
200	Qj33-02	383224	750212	I3	Beta-5160	33510	>			-29	-38.4	MSL	BEB	wood	10
201	Qj33-02	383224	750212	I3	Beta-5161	35140	>			-29	-36.4	MSL	BEB	macerated pea	10
202	Rj12-01	382948	750306	K1	Beta-5163	36840	>			-19	-24.4	MSL	ASB	wood	10
203	Id22-04	391307	753332	360-VC-1A	Beta-41262	780	70	797-635	716	26	25.5	NGVD29	DOV	sediment	10
204	Id22-04	391307	753332	360-VC-1B	Beta-41263	15720	520	19866-17505	18686	26	21.3	NGVD29	DOV	sediment	10
205	Ie31-a	390718	752951	SJ91-3-168-172	Beta-49223	1470	130	1620-1082	1351	1.75	-3.75	MHW	LTC	sediment	10
206	Ie31-a	390718	752951	SJ91-3-277-285	Beta-49224	2150	160	2492-1719	2106	1.75	-7.35	MHW	LTC	sediment	10
207	Ie31-a	390718	752951	SJ91-3-415-420	Beta-49225	1900	140	2153-1507	1830	1.75	-11.9	MHW	LTC	sediment	10
208	Ie31-h	390722	752942	SJ91-4-105-115	Beta-49226	600	70	662-515	589	1.75	-1.65	MHW	LTC	sediment	10
209	Ie31-g	390722	752943	SJ91-5-210-218	Beta-49227	350	80	526-275	401	1.75	-5.15	MHW	LTC	sediment	10
210	Ie31-f	390722	752944	SJ91-6-313-328	Beta-49228	1750	80	1839-1500	1670	1.75	-8.55	MHW	LTC	sediment	10
211	Ie31-e	390722	752945	SJ91-7B-466-473	Beta-49229	3430	90	3894-3465	3680	1.75	-13.55	MHW	LTC	sediment	10
212	Rl25-01	382828	745025	CW93-076-2	AA-14749	49900	>			-75.5	-84.2	MSL	SOU	shell-Astarte	10
213	Id11-e	391430	753454	LR90-DC3	Beta-41264	790	80	910-639	775	1	-1.6	MHW	DOV	peat	20,25
214	Id11-e	391430	753454	LR90-DC3	Beta-41265	1400	100	1508-1122	1315	1	-8.35	MHW	DOV	peat	20,25
215	Id11-e	391430	753454	LR90-DC3	Beta-41266	2350	80	2520-2282	2401	1	-11.1	MHW	DOV	peat	20,25
216	Id11-e	391430	753454	LR90-DC3	Beta-41267	5420	90	6352-5988	6170	1	-13.4	MHW	DOV	peat	20,25

DGS #	DGSID	Latitude	Longitude	LOCALID	Laboratory Id #	R.C. Date (5568)	+ or - (yrs.)	CALIB Range (yrs. BP)	CALIB Date (yrs. BP)	L.S.E. (ft.)	E.T.S. (ft.)	Sample Datum	Quad	Sample Type	Reference Number
217	Pj42-a	383618	750336	IR	AA-12728	2935	65	3263-2877	3070	0	0	MHW	BEB	shell-Merc.	21
218	Pj42-a	383618	750336	IR	AA-12729	3070	115	3479-2939	3209	0	0	MHW	BEB	shell-Merc.	21
219	Qg34-08	383206	751624	MSB 11	Beta-78724	19470	110			37	32	MHW	MSB	sediment	10
220	Id11-i	391413	753439	AB91-2-6-18-22	Beta-49214	2370	90	2719-2295	2507	9	8.41	MSL	DOV	sediment	26
221	Id11-j	391422	753426	AB91-3-2-250-252	Beta-49215	1880	100	2011-1550	1781	5	-3.2	MSL	DOV	sediment	26
222	Id11-f	391436	753424	AB91-4-1-405-409	Beta-49216	2480	80	2736-2357	2547	1.4	-11.88	MSL	DOV	sediment	26
223	Id11-g	391436	753426	AB91-4-3-495-500	Beta-49217	3490	80	3934-3557	3746	2.9	-13.34	MSL	DOV	sediment	26
224	Id11-h	391435	753420	AB91-4-6-202-208	Beta-49218	880	80	927-670	799	3.4	-3.23	MSL	DOV	sediment	26
225	Id11-h	391435	753420	AB91-4-6-369-374	Beta-49219	2010	70	2140-1808	1974	3.4	-8.7	MSL	DOV	sediment	26
226	Id14-a	391448	753121	LR91-L-6-78-85	Beta-49220	2190	80	2342-1994	2168	1	-1.56	MSL	DOV	sediment	26
227	Id14-a	391448	753121	LR91-L-6-470-480	Beta-49221	2260	130	2518-1949	2234	1	-14.42	MSL	DOV	sediment	26
228	Id14-a	391448	753121	LR91-L-6-795-800	Beta-49222	3620	100	4156-3684	3920	1	-25.08	MSL	DOV	sediment	26
229	Kc21-a	390312	755400	7K-E-12	I-6045	9840	140	11765-10799	11282	50	44	MSL	MAR	wood	27
230	Bb33-f	394742	754203	7NC-A-2	UGa-4322	7790	30	8573-8424	8499	278	276.7	MSL	KES	sediment	27
231	Bb33-f	394742	754203	7NC-A-2	UGa-4323	11480	400	14373-12604	13489	278	276.1	MSL	KES	sediment	27

Appendix B
7.5-Minute Quadrangles and Abbreviations



Delaware Geological Survey
University of Delaware
Newark, Delaware 19716