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UNIVERSITY OF WISCONSIN RADIOCARBON DATES XXIV

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Procedures and equipment used in the University of Wisconsin laboratory have been described in previous date lists. Except as otherwise indicated, wood, charcoal, and peat samples are pretreated with dilute NaOH—$NA_4P_2O_7$ and dilute H_3PO_4 before conversion to the counting gas methane; when noted, marls and lake cores are treated with acid only. Very calcareous materials are treated with HCL instead of H_3PO_4. Pretreatment of bone varies with the condition of the bone sample; solid bone with little deterioration is first cleaned manually and ultrasonically. The bone is treated with 8% HCL for 15 minutes, then dilute NaOH—$Na_4P_2O_7$ for 3 hours at room temperature, washed until neutral, and the collagen extracted according to Longin (1971). Charred bone is treated with dilute HCL, NaOH—$Na_4P_2O_7$, and then dilute HCL again.

The dates reported have been calculated using 5568 yr as the half-life of ^{14}C. The standard deviation quoted includes only 1σ of the counting statistics of background, sample, and standard counts. Background methane is prepared from anthracite, standard methane from NBS oxalic acid. The activities of the dated samples for which $\delta^{13}C$ values are listed have been corrected to correspond to a $\delta^{13}C$ value of $-25‰$; the activity of the standard methane has been corrected to $-19‰$.

Sample descriptions are based on information supplied by those who submitted samples.

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ARCHAEOLOGIC SAMPLES

United States

Indiana

Jennison Guard site (12D29S) series

Samples coll from Jennison Guard site (12D29S), Dearborn Co (39° 06′ 03″ N, 84° 50′ 15″ W) by J K Blosser and subm by K D Vickery, Univ

Cincinnati, Ohio. Site is single-component Middle Woodland habitation containing Steuben and Snyders-like projectile points, limestone and grit/limestone tempered Twin Mounds Plain and Cordmarked pottery types with some decorated ceramics, bladelets of Flint Ridge and Harrison Co flint, and mica cutouts and debris, including one Snyders-like projectile point effigy.

WIS-1744. **1800 ± 70**
$\delta^{13}C = -24.9‰$

Wood charcoal from Unit F2, Level 3.

WIS-1745. **1660 ± 70**
$\delta^{13}C = -25.5‰$

Wood charcoal from Unit F2, Level 2.

WIS-1746. **1810 ± 70**
$\delta^{13}C = -27.0‰$

Wood charcoal from Feature 3, Levels 3 and 4.

General Comment: dates are acceptable for Middle Woodland occupation of site, estimated between AD 1 and 300. Earlier date of WIS-1745 corresponds with underlying stratigraphy and upper portion of midden deposit (Zone II), respectively, in same excavation Unit F2. (WIS-1744 was taken from lower 5cm of third 10cm cut below plow zone, in (sub-midden) Zone III. WIS-1745 was taken from upper 5cm of second 10cm cut below plow zone, Zone III, which was midden portion of site).

Nebraska

Bill Packer site (25Sm9) series

Sample coll 1980–81 from Bill Packer site (25Sm9), Sherman Co (41° 23′ N, 98° 46′ W) by G F McKenzie and subm by J Ludwickson, Nebraska State Hist Soc, Lincoln. Three dates from Great Oasis storage pit, 1 date from later Central Plains tradition (Itskari [Loup River] phase) lodge (McKenzie & Holen, 1983).

WIS-1762. **900 ± 70**
$\delta^{13}C = -25.6‰$

Wood charcoal from Great Oasis storage pit.

WIS-1763. **970 ± 70**
$\delta^{13}C = -25.7‰$

Wood charcoal from Great Oasis storage pit.

WIS-1764. **940 ± 70**
$\delta^{13}C = -25.1‰$

Wood charcoal from Great Oasis storage pit.

WIS-1765. **670 ± 70**
$\delta^{13}C = -25.2‰$

Wood charcoal from storage pit in floor of Itskari (Loup River) phase lodge.

General Comment: dates for Great Oasis occupation are similar to those from other Great Oasis sites despite being 100 miles beyond known range. Itskari phase data is consistent with context, confirming 200 yr lapse in occupations.

WIS-1795. Archaeologic site (25Mo86) **970 ± 70**
$\delta^{13}C = -22.0‰$

Wood charcoal from hearth at site 25Mo86, Morrill Co (41° 29′ N, 102° 50′ 30″ W) coll by R Cape and subm by R Bozell, Nebraska State Hist Soc. Sample from single-component Woodland camp assoc with Ash Hollow Cord Roughened pottery (Kivett, 1952; Champe, 1946).

General Comment: date is generally consistent with other Central Plains subarea Woodland dates, ranging from 1150 ± 150 to 750 ± 90 BP. Date lends further support to notion that Woodland culture in this portion of subarea persisted relatively late.

Shipman site (25Wt7) series

Wood charcoal coll 1941 from Shipman site (25Wt7) Webster Co (40° 05′ N, 98° 23′ W) by M F Kivett and G S Metcalf; subm by J Ludwickson. Samples are from two Upper Republican phase house ruins (Ludwickson, 1979).

WIS-1796. **810 ± 70**
$\delta^{13}C = -24.3‰$

Sample from Lodge 1.

WIS-1797. **660 ± 70**
$\delta^{13}C = -26.8‰$

Sample from post hole in Lodge 4.

WIS-1798. **690 ± 70**
$\delta^{13}C = -26.6‰$

Sample from post hole in Lodge 4.

WIS-1799. **430 ± 70**
$\delta^{13}C = -26.6‰$

Sample from post hole in Lodge 4.

WIS-1800. **620 ± 70**
$\delta^{13}C = -26.2‰$

Sample from post hole in Lodge 4.

530 ± 70

WIS-1801. $\delta^{13}C = -26.9‰$

Sample from post hole in Lodge 4.

670 ± 70

WIS-1814. $\delta^{13}C = -26.1‰$

Sample from wall post hole in Lodge 4.

General Comment: Shipman site is basis for three-subphase model of Upper Republican phase development. Dates are consistent with interpretation, confirming 14th century subphase III.

Ohio

Sand Ridge site (33Ha17) series

Samples coll 1974–75 from Sand Ridge site (33Ha17), Hamilton Co (39° 06′ 05″ N, 84° 23′ 45″ W) by R E Riggs *et al* and subm by R E Riggs, Univ Wisconsin-Madison (Starr, 1960). *Comment:* dates fall within expected ranges.

1230 ± 70

WIS-1747. $\delta^{13}C = -26.2‰$

Wood charcoal from Level 10, thick Late Woodland-Newtown phase midden.

1080 ± 70

WIS-1748. $\delta^{13}C = -26.0‰$

Wood charcoal from Level 6, upper portion of Late Woodland-Newtown phase midden.

820 ± 70

WIS-1793. $\delta^{13}C = -24.8‰$

Wood charcoal from Level 4, Fort Ancient tradition midden.

Turpin site (33Ha19) series

Samples coll summer 1981 from Turpin site (33Ha19) Hamilton Co (39° 06′ 52″ N, 84° 23′ 39″ W) and subm by R E Riggs (Starr, 1960; Oehler, 1973). *Comment:* all dates fall within expected ranges and in proper stratigraphic order.

1140 ± 70

WIS-1749. $\delta^{13}C = -26.2‰$

Wood charcoal from Feature 4, Late Woodland-Newtown phase deposit containing Newtown phase ceramics and lithics.

1320 ± 70

WIS-1750. $\delta^{13}C = -25.7‰$

Wood charcoal from Feature 8, pit containing Newtown phase pottery and Late Woodland corner-side-notched variety projectile point.

1460 ± 70

WIS-1751. $\delta^{13}C = -26.0‰$

Wood charcoal from Level 6, late Woodland-Newtown phase midden containing Newtown phase artifacts and some intermixed Fort Ancient materials.

1320 ± 70

WIS-1792. $\delta^{13}C = -25.2‰$

Wood charcoal from Level 11, Late Woodland-Newtown phase midden.

South Dakota

300 ± 70

WIS-1794. Angostura Reservoir site (39Fa69) $\delta^{13}C = -26.3‰$

Wood charcoal coll Sept 1985 from Angostura reservoir site, Fall River Co (43° 17′ N, 103° 30′ W) by T Church and subm by R A Alex, South Dakota Archaeol Research Center, Ft Meade. Hearth charcoal was recovered when reservoir water receded. Hearth was flooded for 40 years.

720 ± 70

WIS-1815. Angostura Reservoir site (39Fa23) $\delta^{13}C = -24.5‰$

Wood charcoal from Angostura Reservoir site, Fall River Co (43° 17′ N, 103° 22′ W) coll and subm by R A Alex. Part of previously undescribed cultural complex in W South Dakota with ceramic affiliation to Initial Variant of Middle Missouri tradition (Wheeler, 1957).

Wisconsin

Double site (47Pi81) series

Charcoal from Double site (47Pi81), Pierce Co (44° 39′ N, 92° 38′ W). Subm by J T Penman, State Hist Soc Wisconsin-Madison. Samples from village and mound complex (Penman, 1984). Previously dated (R, 1978, v 20, p 163; 1986, v 28, p 1210). *Comment:* Features 1, 3, and 4 were dated. These features produced oak (*Quercus* sp) id by L A Zalucha, also id was *Polygonum, Chenopodium,* and corn in Feature 3. Dates for Double site fall into range of dates for Diamond Bluff site (47Pi2) 3km S of Double. Date on burned bone from Mound "K" is first ^{14}C date for Oneota conical mound.

890 ± 70

WIS-1775. $\delta^{13}C = -25.5‰$

Sample coll by C Rohrbaugh and R Saft in Aug 1984 from Oneota mound. Most of sample was charcoal mixed with charred bone from Mound K.

WIS-1776. **930 ± 70**

Oak and willow charcoal coll June 1984 by J T Penman from Feature 3.

2080 ± 70

WIS-1861. Bachmann site (47Sb202) $\delta^{13}C = -26.0‰$

Wood charcoal coll June 1986 from Bachmann site, Sheboygan Co (43° 43′ N, 87° 48′ W) by L A Rusch and subm by J T Penman. *Comment:* dates from test excavations (Rusch & Penman, 1985) did not contain diagnostic artifacts (R, 1986, v 28, p 1211). This sample from Feature 16 contains Early Woodland ceramics and is only Early Woodland site in Wisconsin within Lake Michigan Basin.

Gottschall Site (47Ia80) series

Wood charcoal coll from Gottschall Rockshelter (47Ia80), Iowa Co (43° 06′ 19″ N, 90° 21′ 01″ W) by R J Salzer *et al* and subm by R J Salzer, Beloit College.

1670 ± 70

WIS-1816. $\delta^{13}C = -26.2‰$

Charcoal from Feature 16, sample nos. 84C15 and 84C16 combined, Millville phase hearth.

970 ± 70

WIS-1817. $\delta^{13}C = -26.7‰$

Charcoal from Feature 1, sample nos. 84C2, 84C3A, and 84C3B combined, Effigy Mound hearth.

1610 ± 70

WIS-1818. $\delta^{13}C = -26.1‰$

Charcoal from Feature 19, sample no. 84C12, Millville phase hearth.

WIS-1819. **1620 ± 70**

Charcoal from Feature 19, sample no. 84C19, Millville phase hearth.

1070 ± 70

WIS-1833. $\delta^{13}C = -27.3‰$

Charcoal from Feature 1, sample nos. 84C6 and 84C8 combined, Effigy Mound hearth.

1630 ± 70

WIS-1834. $\delta^{13}C = -26.1‰$

Charcoal from Feature 16, sample no. 84C18, Millville phase hearth.

General Comment: WIS-1816 and -1834: AD 280 and 320 respectively, were coll from Feature 16, Millville phase hearth. Feature is stratigraphically earlier than Feature 19, WIS-1818 and -1819: AD 340 and 330. Dates agree with accepted range of Millville phase dates at other sites in area.

Two remaining samples, WIS-1817 and -1833, AD 980 and 880, date Feature 1, hearth that can be stratigraphically assoc with Effigy Mound culture that occupied S Wisconsin from AD 700–1200. Feature 1 has origins above stratum that produced "splash" of blue-black pigment used to paint >40 paintings on wall of rock shelter.

Direct dating of prehistoric rock art has only been rarely achieved. Gottschall dates minimal chronologic estimate for at least some of rock art at site. Some motifs of human and animal figures have counterparts in shell engraving at Spiro site (Oklahoma) and Cahokia site (Illinois) at later times (ca AD 1100–1300).

Fred Edwards site (47Gt377) series

Wood charcoal coll Aug 1985 from Fred Edwards site (47Gt377), Grant Co (42° 43′ 30″ N, 90° 50′ 58″ W) by K Karstens and subm by J B Stoltman, Dept Anthropol, Univ Wisconsin-Madison. Samples date Middle Mississippian contacts in SW Wisconsin (R, 1986, v 28, no. 3, p 1211). *Comment:* all dates within range for site except WIS-1854, which is much too young and cannot be explained.

WIS-1773. **990 ± 70**
$\delta^{13}C = -26.6‰$

Sample from Feature 63, basin-shaped pit containing Late Woodland and Middle Mississippian ceramics.

WIS-1774. **810 ± 70**
$\delta^{13}C = -27.0‰$

Sample from Feature 67, basin-shaped pit containing Late Woodland (Hartley Cross-Hatched, Hartley Tool Impressed) and Middle Mississippian ceramics.

WIS-1853. **920 ± 70**
$\delta^{13}C = -26.5‰$

Sample from Feature 63, same as WIS-1773, above.

WIS-1854. **650 ± 70**
$\delta^{13}C = -26.3‰$

Sample from Feature 50, deep basin-shaped pit.

WIS-1864. **980 ± 70**
$\delta^{13}C = -26.5‰$

Sample from Feature 47, basin-shaped pit.

GEOLOGIC SAMPLES

United States

Delaware

Walters Puddle series

Core coll June 1985 from Walters Puddle, New Castle Co (39° 24′ N, 75° 41′ 30″ W) by R Thompson *et al* and subm by P Newby, Brown Univ, Providence, Rhode Island. All depths from water/sediment interface, water depth 1m.

WIS-1802. **5820 ± 80**

Organic mud from 52 to 61cm.

WIS-1803. **11,880 ± 160**

Organic clay from 63 to 69cm.

WIS-1804. **14,400 ± 150**

Organic clay from 109 to 116cm.

Florida

Lake Tulane series

Core coll 1984 from Lake Tulane, Highlands Co (27° 35′ N, 81° 30′ W) and subm by H E Wright, Jr, Univ Minnesota, Minneapolis. All measurements from datum 36cm above lake water surface, water depth 22.3m. Dated to provide sedimentation rate. All samples were organic silty lake sediment (Watts, 1980; R, 1986, v 28, no. 3, p 1216).

WIS-1752. **4650 ± 70**

2592 to 2602cm depth.

WIS-1753. **9810 ± 90**

2798 to 2808cm depth.

WIS-1754. **17,170 ± 210**

3152 to 3162cm depth (one 4-day count).

WIS-1755. **24,210 ± 400**

3352 to 3362cm depth (one 5-day count).

WIS-1756. Lake Verona **>33,000**

Core coll April 1985 from Lake Verona, Highlands Co (27° 36′ N, 81° 30′ W) and subm by H E Wright, Jr. Gyttja from 2964 to 2974cm below water surface, water depth 2235cm (Watts, 1975).

Sheelar Lake series

Core coll 1980 from Sheelar Lake, Gold Head Branch State Park, Clay Co (29° 50′ N, 81° 57′ 30″ W) and subm by H E Wright, Jr. Dates provide chronology for vegetation history of region. All measurements from water surface, water depth 18.5m (Watts & Stuiver, 1980). Date previously reported, WIS-965 (R, 1979, v 21, p 126).

WIS-1809. **6000 ± 100**

Gyttja from 2010 to 2018cm depth.

WIS-1810. **11,170 ± 100**

Gyttja from 2192 to 2200cm depth.

WIS-1811. **12,760 ± 130**

Gyttja from 2263 to 2272cm depth.

WIS-1812. **14,360 ± 140**

Gyttja from 2407 to 2415cm depth.

WIS-1813. **17,690 ± 220**

Gyttja from 2462 to 2472cm depth.

Maine

Caribou Bog series

Livingstone core, 5cm diam, coll Aug 1975 from Caribou Bog, Penobscot Co (45° 56′ N, 68° 46′ W) by K Gajewski *et al* and subm by K Gajewski, Univ Wisconsin-Madison. Dated to provide Holocene history. All depths from bog surface (Gajewski, 1979).

WIS-1757. **1880 ± 70**

Sphagnum peat from 145 to 150cm depth.

WIS-1758. **3820 ± 80**

Sphagnum peat from 275 to 280cm depth.

WIS-1759. **6470 ± 70**

Fibrous peat from 501 to 510cm depth.

WIS-1760. **7840 ± 80**

Lake sediment from 600 to 605cm depth.

WIS-1761. **9390 ± 90**

Inorganic lake sediment from 741 to 751cm depth. Dates transition from glacio-marine to freshwater sediment.

Massachusetts

Houghton Pond series

Livingstone core, 2″ diam, coll from Houghton Pond, Norfolk Co (42° 12′ 22″ N, 71° 05′ 35″ W) and subm by R S Webb, Brown Univ. All depths from water/sediment interface, water depth 11.8m.

WIS-1771. **3790 ± 80**

Gyttja from 297 to 306cm.

WIS-1772. **8930 ± 90**

Gyttja from 556 to 566cm.

No Bottom Pond series

Core coll Feb 1986 from No Bottom Pond, Barnstable Co (41° 45′ N, 70° 03′ 30″ W) by R Webb *et al* and subm by P Newby and R Webb. All depths from water/sediment interface, water depth 10.0m.

WIS-1829. **3710 ± 70**

Dark organic lake mud from 149.5 to 155.5cm.

WIS-1830. **4560 ± 70**

Dark organic lake mud from 396.5 to 403.5cm.

WIS-1831. **6040 ± 80**

Dark organic lake mud from 563.5 to 567.5cm.

WIS-1832. Walden Pond **530 ± 70**

Frozen core coll Aug 1979 from Walden Pond, Middlesex Co (42° 26′ N, 71° 20′ W) by R L Steventon *et al* and subm by M J Winkler, Univ Wisconsin-Madison. Gyttja from 78 to 81cm below water/sediment interface, water depth 28.8m.

Owl Pond series

Livingstone core, 5cm diam, coll July 1985 from Owl Pond, Brewster Co (41° 46′ 11″, 70° 01′ 02″ W) by R S Webb *et al* and subm by P Tzedakis, Brown Univ. Dated to calculate sedimentation rate for paleo-climatic interpretation. All measurements from water/sediment interface, water depth 9.13m.

WIS-1865. **10,270 ± 140**

Gyttja with fibrous plant fragments and spruce pollen from 892 to 904cm, basal date.

WIS-1866. **6810 ± 80**

Gytta from 589.5 to 597.5cm depth. Dates oak pollen peak and rise in beech pollen.

WIS-1867. **3190 ± 80**

Gyttja from 393.7 to 401.2cm depth. Dates high pine and oak pollen percentages, with rise in hickory and decrease in hemlock.

WIS-1868. **1180 ± 70**

Gytta from 195 to 204cm depth. Dates high oak and hickory pollen percentages.

Minnesota

WIS-1766. Simonson Swamp **2380 ± 70**

Livingstone core, 5cm diam, from Simonson Swamp, Otter Tail Co (46° 13′ 24″ N, 95° 19′ 14″ W) coll March 1985 by J E Almendinger *et al* and

subm by J E Almendinger and E J Cushing, Univ Minnesota, Minneapolis. Organic lake sediment from just above peat-marl contact, 132 to 138cm below peat surface.

WIS-1767. Greip Fen **10,200 ± 100**

Livingstone core, 5cm diam, from Greip Fen, Otter Tail Co (46° 13′ 11″ N, 95° 14′ 37″ W). Same as WIS-1766, above. Organic lake sediments from just above peat-marl contact, 240 to 245cm below peat surface.

WIS-1768. North Maple Fen **5090 ± 80**

Livingstone core, 5cm diam, from North Maple Fen, Otter Tail Co (46° 11′ 17″ N, 95° 14′ 11″ W). Same as WIS-1766, above. Organic lake sediments from just above peat-marl contact, 274 to 282cm below peat surface.

South Maple Lake series

Livingstone core, 5cm diam, from South Maple Lake, Otter Tail Co (46° 10′ 29″ N, 95° 13′ 47″ W) coll Feb 1984, by J E Almendinger *et al* and subm by J E Almendinger. Measurements from water surface, water depth 117cm. Previously dated (R, 1986, v 28, p 1218).

WIS-1784. **1560 ± 70**

Organic lake sediment from 173 to 181cm. Dates rise in concentration of fine-grained magnetic particles, possibly related to "Little Ice Age."

WIS-1785. **4970 ± 70**

Organic lake sediment from 303 to 311cm. Dates oldest undisturbed limnic sediment, marking time that basin was perennially filled with water.

Upper Graven Lake series

Livingstone core, 5cm diam, from Upper Graven Lake, Otter Tail Co (46° 11′ 04″ N, 95° 18′ 25″ W) coll Feb 1984, by J E Almendinger *et al* and subm by J E Almendinger. Measurements from water surface, water depth 111cm (R, 1986, v 28, p 1219).

WIS-1786. **1440 ± 70**

Organic lake sediment from 186 to 194cm (same comment as WIS-1784, above).

WIS-1787. **8240 ± 90**

Organic lake sediment from 522 to 532cm (same comment as WIS-1785, above).

WIS-1835. **10,350 ± 110**
$\delta^{13}C = -28.4‰$

Wood *Picea* sp from 453 to 456cm.

WIS-1836. **10,890 ± 100**

Organic lake sediment from 448 to 463cm. Dated and compared to WIS-1835, above, to provide correction term to account for old carbonate errors.

WIS-1788. Cora Lake **1010 ± 70**

Livingstone core, 5cm diam, from Cora Lake, Otter Tail Co (46° 09′ 54″ N, 95° 19′ 27″ W) coll Feb 1984, by J E Almendinger *et al* and subm by J E Almendinger. Organic lake sediment from 269 to 277cm below water surface. Water depth 227cm. Same comment as WIS-1784, above (R, 1986, v 28, p 1219).

Reidel Lake series

Livingstone core, 5cm diam, from Reidel Lake, Otter Tail Co (46° 12′ 43″ N, 95° 17′ 03″ W) coll Feb 1984, by J E Almendinger *et al* and subm by J E Almendinger. Measurements from water surface. Water depth 382cm (R, 1986, v 28, p 1219).

WIS-1789. **2180 ± 70**

Organic lake sediment from 650 to 660cm (same comment as WIS-1784, above).

WIS-1790. **5940 ± 80**

Organic lake sediment from 1160 to 1170cm. Dates small peak in grain size of magnetic particles.

Montana

Guardipee Lake series

Core coll Sept 1984 from Guardipee Lake, Glacier Co (48° 33′ 30″ N, 112° 43′ W) and subm by C W Barnosky, Carnegie Mus Nat Hist, Pittsburgh. Depths measured from water surface, water depth 2.2m. Acid treatment only.

WIS-1769. **10,360 ± 100**

Silty, marly clay from 425 to 440cm depth.

WIS-1770. **14,860 ± 140**

Silty, marly clay from 763 to 780cm depth.

WIS-1791. Lost Lake **17,040 ± 210**

Core coll July 1985 from Lost Lake, Choteau Co (47° 38′ N, 110° 29′ W) and subm by C W Barnosky. Lake sediment from 2243 to 2258cm below water surface, water depth 718cm. Acid treatment only.

New York

Burden Lake series

Livingstone core, 5cm diam, from Burden Lake, Rensselaer Co (42° 36′ 16″ N, 73° 34′ W) coll by D C Gaudreau *et al* and subm by D C Gau-

dreau, Brown Univ. Core dated to provide Holocene pollen analysis. Water depth 11.2m; measurements from sediment surface. Dates previously reported (R, 1983, v 25, p 161).

WIS-1737. **1600 ± 70**

Gyttja from 50 to 55cm depth. Uppermost date.

WIS-1738. **2500 ± 70**

Gyttja from 150 to 155cm depth. Dates increase in chestnut (*Castanea*) pollen.

WIS-1739. **4000 ± 70**

Gyttja from 420 to 425cm depth. Dates increase in chestnut (*Castanea*) pollen.

WIS-1740. **4820 ± 70**

Gyttja from 580 to 585cm depth. Dates peak in hemlock (*Tsuga*) pollen.

WIS-1741. **5510 ± 80**

Gyttja from 650 to 655cm depth. Dates peak in hickory (*Carya*) pollen.

WIS-1742. **7340 ± 80**

Gyttja from 820 to 825cm depth. Dates increase in hickory (*Carya*) pollen.

WIS-1743. **8250 ± 90**

Gyttja from 940 to 945cm depth. Dates increase in beech (*Fagus*) pollen.

Oregon

Warner Valley series

Samples coll 1984 from Swamp Lake, Warner Valley, Lake Co (42° 32′ N, 119° 50′ W) and subm by S P Harrison, School Geog, Oxford, UK.

WIS-1779. **510 ± 70**

Sandy clay loam with finely disseminated charcoal fragments.

WIS-1780. **210 ± 70**

Organic plant debris.

WIS-1781. **280 ± 70**
$\delta^{13}C = -10.0‰$

Anodonta shell fragments from 20cm below lake level. Base and acid treatment (Yapp, 1978).

830 ± 70

WIS-1783. $\delta^{13}C = -10.1‰$

Anodonta shell fragments from 20cm below lake level. Base and acid treatment (Yapp, 1978).

Modern

WIS-1782. $\delta^{13}C = -10.5‰$

Living shell from Hart Lake (42° 23′ N, 119° 5′ W). Base and acid treatment (Yapp, 1978).

Pennsylvania

Spring Lake series

Core coll Sept 1985 from Spring Lake, Bradford Co (41° 37′ N, 76° 20′ W) and subm by C W Barnosky. Measurements from water surface, water depth 3.3m.

WIS-1837. **9280 ± 100**

Fine detritus gyttja from 1105 to 1115cm depth; dates increase in *Fagus* pollen percentages.

WIS-1838. **10,250 ± 110**

Fine detritus gyttja from 1305 to 1315cm depth; dates increase in *Tsuga* and *Quercus* pollen percentages.

WIS-1839. **12,670 ± 120**

Fine detritus gyttja from 1425 to 1435cm depth; dates increase in *Pinus* pollen percentages.

Wisconsin

WIS-1777. Otter Island Bog **1420 ± 80**

Hiller core coll Aug 1985 from Otter I. Apostle Is., Ashland Co (46° 57′ N, 90° 32′ 30″ W) and subm by A M Swain, Univ Wisconsin-Madison. Sample from 118 to 125cm depth just above transition from inorganic sediment to *Sphagnum* peat.

Wyoming

Emerald Lake series

Core coll Aug 1985 from Emerald Lake, Teton Natl Forest (44° 04′ 30″ N, 110° 17″ W) and subm by C W Barnosky. Measurements from water surface, water depth 5.9m. Glacier Peak B ash (ca 11,200 yr BP) occurs at 1119cm below surface.

WIS-1840. **10,260 ± 110**

Fine detritus gyttja from 1000 to 1010cm depth; dates increase in *Pinus* pollen percentage.

WIS-1841. **10,700 ± 110**

Fine detritus gyttja from 1037.5 to 1052.5cm depth, dates increase in *Picea* pollen percentages.

Lily Lake Fen series

Core coll Aug 1985 from Lily Lake Fen, Teton Natl Forest (46° 12′ 50″ N, 110°19′ 30″ W) and subm by C W Barnosky. Measurements from surface.

WIS-1842. **11,130 ± 110**

Fine detritus gyttja from 1082 to 1092cm depth; dates increase in *Picea* pollen percentages and spread of Engelmann spruce near site.

WIS-1843. **12,370 ± 120**

Fine detritus gyttja from 1152.5 to 1167.5cm depth; dates increase in *Betula* and decrease in Cyperaceae pollen percentages. Glacier Peak B ash (ca 11,200 yr BP) occurs at 1140cm.

Mariposa Lake series

Core coll Aug 1985 from Mariposa Lake, Yellowstone Natl Park (44° 09′ N, 110° 17″ W) and subm by C W Barnosky. Measurements from water surface, water depth 143cm.

WIS-1844. **9810 ± 110**

Fine detritus gyttja from 400 to 418cm depth; dates decrease in *Artemisia* pollen percentages.

WIS-1845. **10,570 ± 110**

Fine detritus gyttja from 460 to 480cm depth; dates increase in *Picea* pollen percentages.

Divide Lake series

Core coll Aug 1985 from Divide Lake, Teton Natl Forest (43° 46′ 30″ N, 110° 14′ W) and subm by C W Barnosky. Measurements from water surface, water depth 7.2m. Glacier Peak B ash (ca 11,200 yr BP) occurs at 1020cm below surface.

WIS-1862. **9800 ± 90**

Fine detritus gyttja from 970 to 980cm depth.

WIS-1863. **11,840 ± 110**

Fine detritus gyttja from 997.5 to 1012.5cm depth.

Canada

Ferry Lake series

Livingstone core, 5cm diam, coll Aug 1985 from Ferry Lake (unofficial name), Quebec (51° 19′ N, 61° 31′ W) by G A King and D R Foster and

subm by G A King, Univ Minnesota. Lake elev 396m, water depth 6.31m. All measurements from water surface. Dated to calculate time of deglaciation, tree arrival, sediment accumulation rates and pollen influx (King, 1985). Acid treatment only.

WIS-1805. **5190 ± 90**

Gyttja from 833 to 842cm, near base of *Picea* zone.

WIS-1806. **3220 ± 80**

Gyttja from 787 to 796cm.

WIS-1807. **2610 ± 80**

Gyttja from 739 to 749cm.

WIS-1808. **1790 ± 70**

Gyttja from 692 to 702cm.

WIS-1852. **8230 ± 110**

Silty gyttja from 885 to 890cm, basal date and time of deglaciation.

WIS-1820. Cirrus Lake **6310 ± 100**

Core coll Aug 1985 from Cirrus Lake (unofficial name), Labrador (52° 18′ N, 58° 22′ W) by G A King and D R Foster and subm by G A King. Lake elev 360m, water depth 102cm. Sample is light brown silty gyttja from 303 to 313cm below water surface. Dates early peak in organic matter (King, 1985). Acid treatment only.

Chili Lake series

Core coll Aug 1985 from Chili Lake (unofficial name), Labrador (52° 19′ N, 60° 23′ W) by G A King and D R Foster; subm by G A King. Lake elev 410m, water depth 3.22m. Same comments as Ferry Lake, above (King, 1985).

WIS-1821. **2440 ± 80**

Dark brown gyttja from 365 to 375cm.

WIS-1822. **3710 ± 80**

Dark brown gyttja from 413 to 423cm.

WIS-1823. **5310 ± 90**

Dark brown gyttja from 461 to 471cm.

WIS-1824. **6220 ± 90**

Dark brown gyttja from 505 to 512cm.

WIS-1850. **7520 ± 120**

Silty gyttja from 546 to 552cm, sample gives basal date and time of deglaciation.

Claude Lake series

Core coll Aug 1985 from Claude Lake (unofficial name) Labrador (53° 35′ N, 58° 35′ W) by G A King and H E Wright, Jr and subm by G A King. Lake elev 480m, water depth 9.93m. Same comments as Ferry Lake, above.

WIS-1825. **1610 ± 70**

Light brown gyttja from 1061 to 1067cm.

WIS-1826. **2440 ± 80**

Light brown gyttja from 1132 to 1137cm. Dates abrupt decrease in organic matter and change in color.

WIS-1827. **5250 ± 90**

Light brown gyttja from 1187 to 1194cm. Dates abrupt increase in organic matter and change in color.

WIS-1828. **6300 ± 90**

Green silty gyttja from 1266 to 1273cm.

Fred's Lake series

Core coll Aug 1985 from Freds Lake (unofficial name), Labrador (53° 30′ N, 63° 42′ W) by G A King and H E Wright, Jr and subm by G A King. Dated to calculate deglaciation time, sediment accumulation, pollen influx and arrival of Boreal tree spp, *Picea mariana, P glauca,* and *Abies balsamea* in area. Lake elev 430m, water depth 344cm. All depths from water surface (King, 1985). Acid treatment only.

WIS-1846. **2210 ± 70**

Brown gyttja from 398 to 407cm.

WIS-1847. **4010 ± 80**

Brown gyttja from 452 to 460cm.

WIS-1848. **5030 ± 90**

Brown gyttja from 514 to 523cm, dates slight decrease in percent organic matter after initial rapid increase.

WIS-1849. **6520 ± 110**

Silty gyttja from 578 to 583cm, basal date and time of deglaciation.

WIS-1851. Traffic Lake **5640 ± 100**

Core coll Aug 1985 from Traffic Lake (unofficial name), Labrador (53° 16′ N, 62° 27′ W) by G A King and H E Wright, Jr and subm by G A King. Lake elev 460m, water depth 2.52m. Brown gyttja from 482 to 489cm below water surface, dates second major increase in percent organic matter in core. Acid treatment only.

WIS-1855. Sardine Lake **7050 ± 80**

Core coll Aug 1985 from Sardine Lake (unofficial name), Labrador (53° 03′ N, 61° 29′ W) by G A King and H E Wright, Jr and subm by G A King. Lake 370m, water depth 2.38m. Silty gyttja from 410 to 415cm below water surface, basal date and time of deglaciation. Acid treatment only.

Access Lake series

Core coll Aug 1985 from Access Lake (unofficial name), Labrador (53° 27′ N, 60° 34′ W) by G A King and H E Wright, Jr and subm by G A King. Lake elev 200m, water depth 2.89m. All depths from water surface. Dates used to calculate sediment accumulation rates, pollen influx and when major Boreal tree spp, *Picea mariana, P glauca,* and *Abies balsamea* colonized region. Acid treatment only.

WIS-1856. **2220 ± 90**

Brown gyttja from 348 to 356cm.

WIS-1857. **3590 ± 80**

Brown gyttja from 409 to 419cm.

WIS-1858. **5200 ± 100**

Brown gyttja from 476 to 486cm, dates slight decrease in percent organic matter after initial rapid increase.

Portugal

WIS-1778. Logoa dos Perus **9980 ± 100**

Sample coll May 1980 from Lagoa dos Perus, near town of Covilha (40° 15′ N, 07° 45′ W) by W A Watts and B Huntley and subm by W A Watts, Botany Dept, Trinity Coll, Dublin 2, Ireland. Silty gyttja from 1232 to 1237cm below lake surface (basal date). Date is min for disappearance of local ice cover at end of last glaciation (Janssen & Woldringh, 1981).

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