

UNIVERSITY OF WISCONSIN RADIOCARBON DATES XXIII*

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Procedures and equipment used in the University of Wisconsin laboratory have been described in previous date lists. The preamplifiers and counting system were replaced in 1977 using modified EG & G Ortec components. Except as otherwise indicated, wood, charcoal, and peat samples are pretreated with dilute NaOH- $\text{Na}_4\text{P}_2\text{O}_7$ 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- $\text{Na}_4\text{P}_2\text{O}_7$ 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- $\text{Na}_4\text{P}_2\text{O}_7$, 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 $\delta^{13}\text{C}$ values are listed have been corrected to correspond to a $\delta^{13}\text{C}$ 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

South Dakota

WIS-1674. Archaeologic site (39La319)

270 $\pm$ 70

Wood charcoal coll Sept 1984 from Site 39La319 Lawrence Co (44° 15' N, 103° 31' W) by T Church and B Rhodd. Subm by T Church, South

*The editors would like to gratefully acknowledge the authors' cooperation in adding detailed comments during the editing process. We believe such additions greatly increase the reader's understanding of the significance of reported dates. We recommend this technique to all authors.

Dakota Archaeol Research Center, Ft Meade. Sample from Feature 1, post hole in undisturbed cultural layer. *Comment:* this site consists of light scatter of lithic materials in Black Hills logging road. Only diagnostic artifact recovered from surface survey was base of Hell Gap projectile point. Excavations revealed post mold containing charcoal. We wished to know if Hell Gap point and post mold were assoc. ^{14}C date on feature indicates it is not assoc with projectile point and that there are at least two cultural components present at site.

WIS-1707. Archaeologic site (39Sb43) $\delta^{13}\text{C} = -25.0\text{‰}$

Wood charcoal from Site 39Sb43, Sanborn Co (44° 03' 14" N, 98° 04' 54" W) coll Aug 1979 by M Hodges and subm by R A Alex, South Dakota Archaeol Research Center. Dates bison kill and processing sta (Buechler & Keller, 1983). *Comment:* excavation of 39Sb43 yielded several artifacts suggesting protohistoric date for this shallowly buried site. Charcoal from 39Sb43 produced recent date which further substantiates investigators' beliefs that site is late. Site is located along Redstone Creek, tributary of James R in E South Dakota.

WIS-1708. Archaeologic site (39Md133) $\delta^{13}\text{C} = -24.5\text{‰}$

Wood charcoal from Site 39Md133, Meade Co (33° 25' N, 103° 10' W) coll July 1984 and subm by R A Alex *et al.* Ceramics from site do not correspond with any known prehistoric cultural complex in South Dakota. *Comment:* 1 of 4 sites of periphery of Black Hills that appears to have some relationship with Middle Missouri cultural tradition of Missouri R valley. Most ceramics from 39Md133 show little resemblance to any previously defined cultural variant. Two rimsherds, however, have vague resemblance to Riggs Ware of Extended Variant of Middle Missouri tradition.

Travis 1 site (39Co213) series

Wood charcoal from Travis 1 site (39Co213), Corson Co (45° 34' 38" N, 100° 29' 48" W) coll 1977 and 1978 by T W Haberman and subm by R A Alex. Ceramics indicate both Initial Middle Missouri and Extended Middle Missouri components (Haberman, 1982). *Comment:* 2 ^{14}C dates for Travis 1 site, 39Co213, help date Extended Middle Missouri variant occupation of Grand-Moreau region of South Dakota. Early dates of AD 1170 do not support hypothesis advanced by Lehmer that Extended Middle Missouri sites in this region were occupied relatively late by groups of S extended Middle Missouri people who had left their villages in central South Dakota and were moving N-ward. Dates also provide interesting perspective on use of W related sp of tobacco, *Nicotiana bigelovii* var *quadrivalvis* (Pursh) East, in Middle Missouri sub-area. Dates suggest occupation late during Neo-Atlantic climatic episode which may have implications for future studies of Plains Village subsistence economies (Haberman, 1985).

WIS-1709. **780 ± 70**
 $\delta^{13}C = -26.5\text{‰}$

Sample from Feature 36, Level 3, trash-filled pit.

WIS-1710. **780 ± 70**
 $\delta^{13}C = -26.9\text{‰}$

Sample from Feature 18, Level 3, bell-shaped cache pit.

WIS-1711. Archaeologic site (39Ht30) **1750 ± 80**
 $\delta^{13}C = -24.5\text{‰}$

Wood charcoal from Site 39Ht30, Hutchinson Co (43° 21' 42" N, 97° 36' 55" W) coll Sept 1983 by M Church and subm by R A Alex. Levels within Mound 1 represent periods of usage from Woodland to Plains Village cultural periods (Beuchler & Keller, 1983). *Comment:* this burial pit in upper levels of Mound I contained at least 12 bundle burials. Ceramics from this burial pit exhibit both Late Woodland and Early Plains Village ceramic attributes. This could be interpreted as evidence for development of early village cultures from indigenous Late Woodland people.

Wisconsin

WIS-1629. North Shore site (47Lc185) **610 ± 70**

Wood charcoal from North Shore site in Brice Prairie, LaCrosse Co (43° 55' N, 91° 16' 55" W). Coll June 1984 by R F Boszhardt *et al* and subm by J P Gallagher, Mississippi Valley Archaeol Center, LaCrosse. Oneota ceramics from Feature 2 and elsewhere at site show similarities to Blue Earth Phase styles in S-central Minnesota (Boszhardt, Sasso & Gallagher, 1984).

Valley View site (47Lc34) series

Wood charcoal coll Aug 1979 from Valley View site, LaCrosse Co (43° 52' N, 91° 12' W) and subm by K Stevenson, Mississippi Valley Archaeol Center (Gallagher & Stevenson, 1980; Stevenson, 1984). *Comment:* dates agree with other Orr phase Oneota dated sites at LaCrosse.

WIS-1630. **400 ± 70**

Sample from Feature 35, basin-shaped Oneota pit containing artifacts and organic remains.

WIS-1666. **350 ± 70**

Sample from Feature 84, basin-shaped Oneota pit containing artifacts and organic remains.

WIS-1631. Olson site (47Lc76) **560 ± 70**

Wood charcoal from Olson site, LaCrosse Co (43° 55' N, 91° 17' W) coll by R Rodell and subm by K Stevenson. Sample from feature containing fire-cracked rock, Oneota artifacts and organic remains (Gallagher, Ro-

dell & Stevenson, 1982). *Comment:* this date, along with Wis-1629, above, indicate earliest Oneota occupation at LaCrosse is Blue Earth phase.

Sand Lake site (47Lc44) series

Samples coll July 1984 from Sand Lake site, LaCrosse Co (43° 55' N, 91° 13' 30" W) by R F Sasso and subm by J P Gallagher. Dates Oneota complex (R, 1984, v 26, p 137; Sasso *et al*, 1984; Gallagher *et al*, 1985).

WIS-1716. **510 ± 70**
 $\delta^{13}C = -27.0\text{‰}$

Charcoal from Feature 47, basin-shaped refuse pit assoc with early ridging episodes. *Comment:* compares with age and context of WIS-1480 (R, 1984, v 26, p 137).

WIS-1717. **330 ± 70**
 $\delta^{13}C = -19.9\text{‰}$

Charcoal containing some corn from Feature 18, large bell-shaped pit above agric ridges.

WIS-1718. **<200**
 $\delta^{13}C = -10.7\text{‰}$

Charred corn fragments from Feature 41, lens of charred corn cobs assoc with lower ridges. *Comment:* date is much too late for sealed contexts.

WIS-1675. Herbert site (47Lc43) **380 ± 70**

Wood charcoal coll Aug 1984 from Herbert site (47Lc43), LaCrosse Co (43° 54' 55" N, 91° 13' 25" W) by R F Boszhardt and subm by J P Gallagher. Sample from Feature 2 containing Blue Earth-like Oneota ceramics (Boszhardt, 1985). *Comment:* date is much too late for Blue Earth ceramics. Possible mixing of sample by later Orr phase activity at site.

WIS-1676. Lower Sand Lake site (47Lc45) **1220 ± 70**

Wood charcoal coll Sept 1984 from Lower Sand Lake site (47Lc45), LaCrosse Co (43° 54' 50" N, 91° 13' 10" W) by R F Boszhardt and subm by J P Gallagher. Dates sealed *in situ* Middle Woodland Trempealeau/Millville phase midden deposit. *Comment:* date agrees with Middle Woodland material.

Karow Cemetery site (47Wn198) series

Wood charcoal coll July 1984 from Karow Cemetery site, Winnebago Co (47° 05' N, 88° 30' W) and subm by V Dirst, Dept Soc Anthropol, Univ Wisconsin-Oshkosh. Artifacts were of Lake Winnebago phase Oneota origin.

WIS-1670. **560 ± 70**

Sample from Feature 5, trash pit, 1m diam, filled with lithic debitage, scraper, hammerstone, and shell-tempered body sherds, some decorated as Lake Winnebago Trilled.

WIS-1671.**620 ± 70**

Sample from Feature 2, dates floor of house.

Sauer Resort site (47Wn207) series

Wood charcoal coll from Sauer Resort site, Winnebago Co (44° 10' N, 88° 46' W) by L. Rusch and D Seurer. Subm by V Dirst. Ceramics were of Lake Winnebago Trained origin.

WIS-1704.**310 ± 70** $\delta^{13}C = -27.0\text{‰}$

Sample from Feature 2, midden containing large quantities of Oneota ceramics.

WIS-1705.**490 ± 70** $\delta^{13}C = -26.1\text{‰}$

Sample from Pit H, undisturbed Oneota shell midden containing shell and grit-tempered sherds, chipping debris, triangular point, three copper hair pipes, bone tools, numerous animal bones, and clam shells.

WIS-1706. Osceola site (47Gt24)**4080 ± 70** $\delta^{13}C = -22.4\text{‰}$

Human charred bone coll Aug 1945 from Osceola site, Grant Co (42° 39' N, 90° 42' W) by R Ritzenthaler and subm by D F Overstreet, Great Lakes Archaeol Research Center, Wauwatosa. Sample from Old Copper type site (Ritzenthaler, 1957, 1958).

Double site (47Pi81) series

Wood charcoal coll May 1984 from Double site, Pierce Co (44° 39' N, 92° 38' W) by C V Svec & J T Penman. Subm by J T Penman, State Hist Soc Wisconsin-Madison. Samples from Village and Mound complex (Penman, 1984) 3km N of Diamond Bluff site (47Pi2), dated AD 995–1195 (R, 1978, v 20, p 163). Double site is probably satellite village of Diamond Bluff site.

WIS-1642.**880 ± 70**

Sample from Feature 1.

WIS-1667.**820 ± 90**

Sample from Feature 4.

WIS-1669. Neeffe site (47Ri59)**1110 ± 100**

Wood charcoal coll Aug 1983 from Neeffe site, Richland Co (43° 12' 31" N, 90° 22' 24" W) by L A Rusch and subm by J T Penman. Sample from Feature 1, dates feature in transitional period between Middle and Early Woodland (Rusch & Penman, 1984). Charcoal id. as *Carya*, *Fraxinus*, and *Quercus* (Zalucha, 1985).

Bachman site (47Sb202) series

Wood charcoal coll Sept 1984 from Bachman site, Sheboygan Co (47° 34' N, 87° 48' W) by J T Penman and L A Rusch. Subm by J T Penman. All cultural material recovered during survey and testing of site is Middle Woodland. *Comment:* Feature 2 at Bachman site (47Sb202) is directly below Feature 1. Neither feature produced diagnostic artifacts such as ceramics or projectile points. Excavations yielded ceramics in other portions of site. Ceramic assemblages included restored vessel along with sherds that all appear similar in manufacture. A vessel was tentatively id. as Kegonsa Stamped in testing report (Rusch & Penman, 1985). Since that pub, J B Stoltman, Univ Wisconsin-Madison, inspected ceramics and believes they represent unnamed Early Woodland type. Dates are clearly too early for Middle Woodland type such as Kegonsa. Zalucha id. oak and sycamore (*Platanus occidentalis*) charcoal in Feature 2.

WIS-1677.**2420 ± 80**

Sample from Feature 2.

WIS-1715.**2320 ± 80**

Sample from Feature 2.

Fred Edwards site (47Gt377) series

Wood charcoal coll July–Aug 1984 from Fred Edwards site (47Gt377), Grant Co (42° 43' 30" N, 90° 50' 58" W) by C Arzigian and F Finney. Subm by J B Stoltman, Dept Anthropol, Univ Wisconsin-Madison. Site is single component village ca 1ha. Archaeol assemblage contains classic Middle Mississippian ceramics (Powell Plain and Ramey Incised) within predominantly Late Woodland ceramic industry that is more aligned with Illinois' Canton Ware than with Wisconsin's Madison Ware. Samples date Middle Mississippian contacts in SW Wisconsin. *Comment:* this series of 10 dates derives from unique single-component site that seems to represent intrusion of Late Woodland peoples into SW Wisconsin from S. Archaeol assemblage displays unmistakable evidence of close interaction with Cahokia cultural sphere during its Stirling phase, which has been estimated to date AD 1050–1150 in Illinois. Eight dates fall tightly into this interval, thereby providing independent confirmation. The other 2 dates, WIS-1663 and -1773, are anomalously early; no doubt best explained as derived from inner rings of large logs (see WIS-1663, below).

WIS-1662.**810 ± 60**

Sample from log in E half of Feature 2, single-post, basin structure.

WIS-1663.**1150 ± 70**

Sample from Feature 8, basin-shaped pit near Feature 6 entryway. WIS-1693 and -1695 confirm that this sample derives from inner rings of larger log, thus does not accurately date F8.

WIS-1664. **880 ± 70**

Sample from Feature 15, sub-floor pit in center of structure (Feature 6) directly assoc with Powell Plain vessel.

WIS-1665. **900 ± 70**

Sample from Feature 26, basin-shaped pit E of F6.

WIS-1668. **860 ± 80**

Sample from 3 post molds (nos. 35, 36 and 59) of Feature 6, single-post, basin structure.

WIS-1693. **790 ± 70**
 $\delta^{13}C = -26.3\text{‰}$

Sample from Feature 8 (see WIS-1663, above). Charred bark from tree.

WIS-1694. **830 ± 70**

Sample from Feature 7, large oval pit containing chert, bone, pottery, and limestone that overlaps NW corner of Feature 6.

WIS-1695. **800 ± 70**
 $\delta^{13}C = -27.1\text{‰}$

Sample from Feature 8 (see WIS-1663, above). Nutshells, predominantly hickory with some walnut.

WIS-1692. Mill Coulee Shell Heap (47Cr100) **1200 ± 70**

Charcoal from Mill Coulee Shell Heap site, Crawford Co (43° 04' N, 91° 09' W) coll July 1983 and subm by J B Stoltman. Dates charcoal directly assoc with shell midden containing preponderantly Lane Farm Cord-Imprinted pottery. Provides first reliable data for Lane Farm phase in SW Wisconsin (R, 1985, v 25, p 459). *Comment:* this sample came from same sealed, undisturbed shell midden as WIS-1585, assoc with Lane Farm Cord-Imprinted pottery. It was subm to confirm first date (1180 ± 70 BP), which was ca 200 yr younger than expected. Close correspondence of 2 dates suggests that Lane Farm phase in SW Wisconsin dates to 8th century AD.

Ecuador

WIS-1632. Yumes site (OG-BL-PL-18) **2230 ± 70**

Wood charcoal from Site OG-BL-PL-18 (01° 36' S, 79° 59' W), Recinto Yumes, Guayas Prov, coll March 1984 and subm by D M Stemper, Anthropol Dept, Univ Wisconsin, Madison. Sample 94cm depth from hearth on deepest use surface, in occupational stratum, later buried by mound building activities.

Yumes site series (OG-BL-PL-5)

Wood charcoal coll Dec 1983 from site OG-BL-PL-5 (01° 34' S, 79° 59' W), Recinto Yumes and subm by D M Stemper.

WIS-1633.**1830 ± 70**

Sample from Feature 2, horseshoe-shaped, oven-like structure with baked-clay walls built contiguous with burial urn.

WIS-1634.**1820 ± 70**

Sample from Feature 6, hearth 50cm below surface of artificial burial mound, 183cm tall. Mound contained 3 burial urns, 1 containing gold ornament.

WIS-1635.**1880 ± 70**

Sample from Feature 9, horseshoe-shaped, oven-like structure with baked-clay walls built contiguous with burial urn.

WIS-1636. Yumes site (OG-BL-PL-4)**360 ± 110**

Wood charcoal from site OG-BL-PL-4 (01° 34' S, 79° 59' W) Recinto Yumes, coll Nov 1984 and subm by D M Stemper. Sample from horseshoe-shaped baked clay-lined hearth on edge of 2.5m artificial mound 25cm below bulldozed surface.

Yumes site (OG-BL-PL-31) series

Charcoal from Site OG-BL-PL-31 (01° 36' S, 79° 59' W), Recinto Yumes, coll and subm Aug 1984 by D M Stemper.

WIS-1688.**320 ± 70**

Sample from Feature 2, burned logs directly under wattle and daub wall.

WIS-1689.**390 ± 80**

Sample from Feature 1, wattle and daub structure foundation.

WIS-1690.**290 ± 70**

Sample from Raised Field 4, Feature 5, agric use at 2.2m below surface.

WIS-1691.**340 ± 70**

Sample from Raised Field 4, Feature 1, carbonized floral remains from ditch in agric use at 0.3m below surface.

*Greece***WIS-1672. Shipwreck****270 ± 70**

Wood removed from hull of shipwreck buried in sand near Alexandropolis (25° 55' 10" N, 40° 30' 08" E) by N Lianos. Subm by N Lianos, Hellenic Inst Marine Archaeol, Athens. Wood id. as *Quercus alba* and *Pinus*.

*Pakistan***Rehman Dheri series**

Charcoal coll March 1984 from Rehman Dheri, Gomal Plain, Dist Dik (31° 50' N, 70° 54' E) by S Nazar and subm by F A Durrani, Dept Archaeol,

Univ Peshawar. Dates help establish time scale for evolutionary stages of Indus civilization (Durrani, 1982; R, 1985, v 27, p 101; Durrani, 1980; Kahn, 1977).

WIS-1697.	4300 ± 70 $\delta^{13}C = -21.2\text{‰}$
Layer 18, depth 5m.	
WIS-1698.	4190 ± 70 $\delta^{13}C = -26.5\text{‰}$
Layer 17, depth 4m.	
WIS-1699.	4180 ± 70 $\delta^{13}C = -24.5\text{‰}$
Layer 9, depth 2.2m.	
WIS-1700.	4070 ± 90
Layer 12, depth 3.0m.	
WIS-1701.	3850 ± 70 $\delta^{13}C = -25.4\text{‰}$
Layer 5, depth 1.2m.	
WIS-1702.	3620 ± 80 $\delta^{13}C = -26.1\text{‰}$
Layer 3, depth 6cm.	
WIS-1703.	3720 ± 80 $\delta^{13}C = -26.0\text{‰}$
Sample from Hissam Dheri 360m N of Rehman Dheri, mature Harappan site (Dani, 1971). Layer 2, 5cm depth.	

Peru

Colca Valley series

Charcoal coll Aug 1984 from sites of Chijra and Chilacota, Village Coporaque, Colca Valley, Arequipa (15° 08' S, 71° 09' W). Subm by W Den-evan, Geography Dept, Univ Wisconsin-Madison. Dates occupation assoc with construction and use of abandoned terraces at archaeol site in Colca Valley.

WIS-1673.	1510 ± 80
Sample coll at Chijra by J Sandor from trench in floor of Terrace 1 adjacent to excavated house ruin. Terrace contained bone and ceramics. Depth 62 to 134cm. Elev 3606m.	
WIS-1696.	1660 ± 80 $\delta^{13}C = -23.6\text{‰}$
Same as WIS-1673, above.	

WIS-1712.**1380 ± 80**

Sample coll at Chijra by M Neira from trench in terrace floor adjacent to excavated house ruin. Depth 55cm. Elev 3604m.

WIS-1713.**1440 ± 80**

Sample coll at Chijra by M Malpass from base of floor of older terrace found within Terrace 1. Depth 240cm. Elev 3605m.

WIS-1714.**1400 ± 80**

Sample coll at Chijra by P de la Veracruz from floor of Terrace 2. Level V. Elev 3640m.

WIS-1736.**1650 ± 70**
 $\delta^{13}C = -23.7\text{‰}$

Sample coll at Chilacota above Chijra by C Goland and J Treacy from fill within wall of prehistoric irrigation canal. Depth 30cm. Elev 3750m.

GEOLOGIC SAMPLES

*United States**Connecticut***Mohawk Pond series**

Core coll Jan 1982 from Mohawk Pond, Litchfield Co (41° 49' N, 73° 17' W) by D C Gaudreau *et al*, subm by D C Gaudreau, Brown Univ, Providence, Rhode Island. Water depth 6.9m. All measurements from sediment/water interface. Core is being used for Holocene pollen analysis. Dates previously reported (R, 1983, v 25, p 158; R, 1984, v 26, p 137–138).

WIS-1719.**1920 ± 80**

Gyttja from 181 to 192cm depth. Dates decline of chestnut (*Castanea*) pollen.

WIS-1720.**2820 ± 80**

Gyttja from 282 to 293cm depth. Dates increase in chestnut (*Castanea*) pollen.

WIS-1721.**4880 ± 80**

Gyttja from 477 to 485cm depth. Dates decline in hemlock (*Tsuga*) pollen.

WIS-1722.**6140 ± 90**

Gyttja from 630 to 638cm depth. Dates decline in oak (*Quercus*) pollen.

WIS-1723.**8320 ± 100**

Gyttja from 850 to 858cm depth. Dates increase in beech (*Fagus*) pollen.

WIS-1724. **9840 ± 90**

Gyttja from 1122 to 1130cm depth. Dates peak in pine (*Pinus*) pollen in early Holocene.

WIS-1725. **13,490 ± 150**

Gyttja from 1276 to 1292cm depth. Dates increase in spruce (*Picea*) pollen.

Florida

Lake Tulane series

Core coll April 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 sediment accumulation rate. All samples were organic silty lake sediment (Watts, 1980; R, 1985, v 27, p 460).

WIS-1646. **3440 ± 80**

2493 to 2503cm depth.

WIS-1647. **7330 ± 90**

2692 to 2702cm depth.

WIS-1648. **10,940 ± 120**

2892 to 2902cm depth.

WIS-1649. **13,930 ± 130**

3052 to 3062cm depth.

WIS-1650. **20,380 ± 230**

3252 to 3262cm depth.

WIS-1651. **26,120 ± 440**

3452 to 3462cm depth.

WIS-1652. **>33,000**

3652 to 3662cm depth.

Massachusetts

Winneconnet Pond series

Core coll Sept 1982 from Winneconnet Pond, Bristol Co (41° 58' N, 71° 07' W) by S Suter *et al* and subm by S Suter, Brown Univ. Water depth 3m. Measurements from sediment surface. Core is being used in study of vegetation history of New England (R, 1985, v 27, p 460–461).

WIS-1637. **2800 ± 70**

Gyttja from 80 to 87cm depth.

WIS-1638. **3620 ± 80**

Gyttja from 180 to 187cm depth.

WIS-1639. **4910 ± 80**

Gyttja from 380 to 385cm depth.

WIS-1640. **8930 ± 90**

Gyttja from 580 to 587cm depth.

WIS-1641. **12,340 ± 120**

Gyttja from 883 to 890cm depth.

Minnesota

Wolsfeld Lake series

5cm core coll Dec 1977 from Wolsfeld Lake, Hennepin Co (45° 00' N, 93° 34' W) and subm by E C Grimm, Univ Minnesota, Minneapolis. Measurements from water surface, water depth 6.5m.

WIS-1623. **6580 ± 80**

Lake sediment from 1410 to 1420cm depth. Marks upward decrease in prairie pollen types and increase in *Ostrya* pollen.

WIS-1624. **7990 ± 110**

Lake sediment from 1515 to 1525cm depth. Marks upward decrease in percentages of deciduous tree pollen types, especially *Ulmus* and *Quercus* and increase in prairie pollen types.

WIS-1625. **10,600 ± 110**

Lake sediment from 1635 to 1645cm depth. Marks top of late-glacial *Picea* zone. *Picea* pollen is replaced by deciduous tree pollen, especially *Ulmus* and *Quercus*.

WIS-1654. Wentzel's Pond **2860 ± 80**

Livingstone core, 5cm diam, from Wentzel's Pond, Hubbard Co (46° 47' N, 49° 57' W). Coll March 1980 and subm by J C Almendinger, Univ Minnesota. Detrital copropel, 180 to 190 below sediment surface. Water depth 1.57m. Decline in prairie forb pollen above this sample marks demise of prairie on this portion of Park-Staples outwash plain. Date, along with others from sand-plain sites in Minnesota, will be used to determine synchroniety of prairie decline and length of time for jack pine forest to develop (R, 1985, v 27, p 461). Acid treatment only.

Hostage Lake series

Livingstone core, 5cm diam, from Hostage Lake, Crow Wing Co (46° 33' N, 94° 08' W). Coll March 1981 and subm by J C Almendinger. Measurements from sediment surface. Water depth 1.5m (R, 1983, v 25, p 159). Acid treatment only.

WIS-1655.**3760 ± 80**

Algal copropel from 380 to 390cm depth. Decline in prairie forb pollen above this sample marks demise of prairie on this portion of Crow Wing outwash plain. Same observations as for WIS-1654, above.

WIS-1661.**240 ± 70**

Detrital copropel from 40 to 45cm depth. Dates rise in *Ambrosia* pollen and decline in pine pollen. Marks beginning of land clearance and agric ca AD 1860 to 1870. Difference will be used to adjust ¹⁴C dates down core. This sec of core coll Oct 1984.

Big John Pond series

Livingstone core, 5cm diam, from Big John Pond, Beltrami Co (47° 33' 30" N, 94° 58' W). Coll Feb 1981 and subm by J C Almendinger. Measurements from sediment surface. Water depth 6m. Previously dated (R, 1983, v 25, p 160). Acid treatment only.

WIS-1658.**3690 ± 80**

Silty algal copropel from 125 to 135cm depth. Decline in prairie forb pollen. This sample marks demise of prairie on this portion of Bemidji sand plain. Same observation as for WIS-1654, above.

WIS-1659.**450 ± 70**

Detrital copropel from 16 to 25cm depth. Same observation as for WIS-1661, above.

Mud Lake series

Livingstone core, 5cm diam, from Mud Lake, Hubbard Co (46° 52' N, 94° 45' W). Coll March 1980 and subm by J C Almendinger. Measurements from sediment surface. Water depth 8.3m (R, 1983, v 25, p 159). Acid treatment only.

WIS-1656.**900 ± 70**

Algal copropel from 37 to 50cm depth. Same observation as for WIS-1661, above.

WIS-1657.**3680 ± 80**

Calcareous algal copropel from 440 to 450cm depth. Same observation as for WIS-1654, above.

WIS-1660. Peterson Slough**3740 ± 80**

Livingstone core, 5cm diam, from Peterson Slough, Becker Co (46° 58' N, 95° 19' W). Coll Feb 1981 and subm by J C Almendinger. Non-calcareous algal copropel from 390 to 400cm below sediment surface, water depth 3.9m. Same observation as for WIS-1654, above.

South Maple Lake series

Livingstone core, 5cm diam, coll Feb 1984 from South Maple Lake, Otter Tail Co (46° 10' 29" N, 95° 13' 47" W) by J E Almendinger *et al* and

subm by J E Almendinger, Univ Minnesota. Samples provide record of past water table fluctuations in region. Depths from water surface, water depth 117cm.

WIS-1726.**3720 ± 80** $\delta^{13}C = -22.4\text{‰}$

Gyttja from 243 to 251cm depth.

WIS-1727.**4650 ± 80** $\delta^{13}C = -21.2\text{‰}$

Gyttja from 276 to 284cm depth.

Upper Graven Lake series

Livingstone core, 5cm diam coll Feb 1984 from Upper Graven Lake, Otter Tail Co (46° 11' 04" N, 95° 18' 25" W) by J E Almendinger *et al* and subm by J E Almendinger. Samples provide record of past water table fluctuations in region. Depths from water surface, water depth 111cm.

WIS-1728.**3990 ± 80**

Gyttja from 316 to 324cm depth.

WIS-1729.**10,810 ± 110**

Gyttja from 590 to 598cm depth.

Cora Lake series

Livingstone core, 5cm diam, coll Feb 1984 from Cora Lake, Otter Tail Co (46° 09' 54" N, 95° 19' 27" W) by J E Almendinger *et al* and subm by J E Almendinger. Samples provide record of past water table fluctuations in region. Depths from water surface, water depth 227cm.

WIS-1730.**5440 ± 80**

Gyttja from 432 to 440cm depth.

WIS-1731.**6080 ± 80**

Gyttja from 469 to 475cm depth.

Reidel Lake series

Livingstone core, 5cm diam, coll Feb 1984 from Reidel Lake, Otter Tail Co (46° 12' 43" N, 95° 17' 03" W) by J E Almendinger *et al* and subm by J E Almendinger. Sample provides basis for calculating rates of sediment influx, dating peaks in relative grain size of inorganic fraction and dating inception of lake following glaciation. Depth from water surface, water depth 382cm.

WIS-1732.**3810 ± 80**

Gyttja from 894 to 906cm depth.

WIS-1733. **8860 ± 90**
 $\delta^{13}C = -28.6\text{‰}$

Gyttja from 1489 to 1499cm depth.

WIS-1734. **10,790 ± 110**

Gyttja from 1617 to 1627cm depth.

WIS-1735. **11,630 ± 120**

Trash layer at base of organic lake sediment consisting of wood fragments and conifer needles (*cf Picea* sp) and moss (*cf Drepanocladus*) from 1959 to 1965cm depth.

Nebraska

WIS-1622. Beaver Lake **6690 ± 80**

Core coll Jan 1967 from Beaver Lake, Cherry Co (42° 28' N, 100° 40' W) and subm by H E Wright, Jr, Univ Minnesota. Sandy organic lake mud from 815 to 830cm below lake level. Water depth 2.0m. Site is in depression between dunes of Nebraska sandhills. Date is min for dune fm in area (Wright, 1970).

South Dakota

WIS-1626. Cottonwood Lake **13,410 ± 120**

5cm core, coll Feb 1984 from Cottonwood Lake, Sully Co (44° 50' N, 99° 55' W) and subm by E C Grimm, Univ Minnesota. Lake sediment from 958 to 968cm depth measured from water surface. Water depth 3.2m. Sample dates late-glacial *Picea*-dominated pollen assemblage.

Washington

Mosquito Lake Bog series

Core coll Sept 1980 from Mosquito Lake Bog, Whatcom Co (48° 40' N, 122° 12' W) by W A Watts *et al* and subm by H E Wright, Jr, Univ Minnesota. Dates determine age of exceptionally early appearance of *Tsuga heterophylla*, confirmed by plant macrofossils, indicating distinctly different vegetation and climatic history in Puget Lowland from region S of Seattle (Hansen & Easterbrook, 1974).

WIS-1619. **11,700 ± 110**

Gyttja from 1907 to 1913cm depth, dates first arrival of *Psuedotsuga* in pollen diagram and early *Tsuga heterophylla* peak.

WIS-1620. **11,430 ± 110**

Gyttje from 1921 to 1923cm depth, dates arrival of *Tsuga heterophylla*, late glacial.

WIS-1621. **13,920 ± 130**

Gyttja with clay bands from 1992 to 1996cm depth. Basal date, peak of *Alnus sinuata* in core, late glacial.

*Wisconsin***Hook Lake Bog series**

Livingstone core, 5cm diam, from Hook Lake Bog, Dane Co (42° 57' N, 89° 20' W) coll July 1980 and subm by M J Winkler, Center for Climatic Research, Univ Wisconsin, Madison. Dated to correlate late-glacial and Holocene pollen and charcoal changes. All measurements from bog surface (R, 1985, v 27, p 463).

WIS-1643. **8600 ± 90**

Decomposed peat from 605 to 615cm depth, elm, oak, and ironwood dominate in this sample.

WIS-1644. **10,470 ± 100**

Peaty gyttja from 756 to 771cm depth.

WIS-1645. **13,470 ± 120**

Clayey gyttja from 890 to 900cm depth, high spruce, beginning of ash, high herbs, and sedge.

WIS-1686. **5360 ± 80**

Peat from 363 to 366cm depth.

WIS-1687. **6660 ± 80**

Peat from 453 to 456cm depth.

Lake Mendota—Middleton series

Livingstone core, 5cm diam, from Lake Mendota, Dane Co (43° 06' N, 89° 29' W) coll Feb 1983 by A M Swain and subm by M J Winkler. Water depth 3.6m; measurements from sediment surface. Dates to be used to interpret Holocene strat and compare with other Lake Mendota cores (R, 1983, v 25, p 164; R, 1984, v 26, p 142–143; R, 1985, v 27, p 462). Acid treatment only.

WIS-1678. **2190 ± 80**

Organic gyttja with marl from 35 to 41cm depth.

WIS-1679. **2840 ± 80**

Marl from 130 to 135cm depth.

WIS-1680. **5130 ± 90**

Marl from 158 to 165cm depth.

WIS-1681. **10,930 ± 130**

Marl from 407 to 420cm depth.

WIS-1682. **12,710 ± 120**

Marl from 583 to 593cm depth.

Lake Mendota series

Livingstone core, 5cm diam, from Lake Mendota, Dane Co (43° 06' N, 89° 25' W) coll Feb 1982 by A M Swain; subm by M J Winkler. Dates from cores coll along transect of varying water depth in University Bay. Same comment as for Lake Mendota, Middleton series, above. Acid treatment only.

WIS-1683. **10,160 ± 100**

Gray silty clay from 886 to 898cm depth, Core C. Water depth 5.9m.

WIS-1684. **9150 ± 90**

Marl from 216 to 226 cm depth, Core D. Water depth 3.7m.

WIS-1685. **12,220 ± 120**

Marl from 455 to 470cm depth, Core D.

WIS-1653. Two Creeks Buried Forest **11,690 ± 130**

Spruce wood log coll Sept 1984 from Manitowoc Co (44° 19' N, 87° 32' 30" W) and subm by K F Kaiser, Swiss Fed Inst Forestry Research, Birmensdorf, Switzerland.

*England***Forest of Bowland series**

Wood samples coll 1983–84 from 8 sites in Langden/Dunsop/Hodder drainage basin of Central Bowland, Lancashire by A M Harvey and W H Renwick. Subm by W H Renwick, Dept Geog, Rutgers Univ, New Brunswick, New Jersey. Dated to detail sequence of Holocene erosion and deposition in upland England (R, 1985, v 27, p 468).

WIS-1627. **1460 ± 70**

Wood from Dunsop Valley (54° 00' N, 02° 32' W). Antedates main aggradation of small cone in upper Dunsop Valley near Whitendale.

WIS-1628. **1780 ± 70**

Wood from Langden Valley near Hareden (53° 57' N, 02° 32' W). Post-dates gully cutting in lower Langden Valley.

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