

## UNIVERSITY OF TEXAS AT AUSTIN RADIOCARBON DATES XIV

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This list reports certain  $^{14}\text{C}$  measurements completed by December 1979; other projects completed by this time will be reported later. Age calculations are based on  $^{14}\text{C}$  half-life of 5568 yr and modern standard of 95‰ NBS oxalic acid, supplemented by tree rings of pre-industrial wood from a log cut in the 1850's (Tx-540; R, 1970, v 12, p 249). Deviations reported are based on counting statistics of sample, background and modern, and are  $\pm 1\sigma$ , except that when sample count approaches either modern or background,  $2\sigma$  limits are reported. Unless noted,  $^{12}\text{C}/^{13}\text{C}$  measurements were not made and results are not corrected for  $^{13}\text{C}$  fractionation (assumed ratio =  $-25\text{‰}$  WRT PDB). Our laboratory uses liquid scintillation counting of benzene, with  $\text{Li}_2\text{C}_2$  and vanadium-activated catalyst in preparation; chemical yields range between 95% and 99%. Three counters are employed; a Packard Tri-Carb Model 3002 and 2 Beckman LS230 spectrometers obtained through a grant from the National Science Foundation.

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## I. OCEANOGRAPHIC SAMPLES

*Bahamas***Great Bahama Bank series, Bahamas**

Samples of carbonate sediment from slope N of Great Bahama Bank, Bahama Is. Coll to determine origin and rate of deposition of breccia deposits and rates of coral growth. Coll 1978 by A C Neumann and subm by M Boardman, Marine Sci Program, Univ North Carolina, Chapel Hill.

<b>Tx-2997. E-29262/40cm</b>	<b>4010 ± 60</b>
30km S of Freeport (26° 19' N, 78° 33' W), 39 to 41cm in core.	$\delta^{13}\text{C} = +3.8\text{‰}$
<b>Tx-2998. E-29262/80cm</b>	<b>26,500 ± 1000</b>
Same location as Tx-2997, 79 to 81cm in core.	$\delta^{13}\text{C} = +1.8\text{‰}$
<b>Tx-2999. E-29262/100cm</b>	<b>35,800 ± 2200</b>
Same location as Tx-2997, 99 to 101cm in core.	$\delta^{13}\text{C} = +2.8\text{‰}$
<b>Tx-3000. E-29262/20cm</b>	<b>2610 ± 60</b>
Same location as Tx-2997, 18.5 to 21.5cm from surface.	$\delta^{13}\text{C} = +3.7\text{‰}$

- Tx-3001. E-29283/7cm** **1970 ± 60**  
 $\delta^{13}C = +3.5\text{‰}$   
15km S of McLean's Town (26° 27' N, 78° 05' W), 6 to 8cm in core.
- Tx-3002. E-29283/20cm** **3860 ± 60**  
 $\delta^{13}C = +3.5\text{‰}$   
Same location as Tx-3001, 19 to 21cm in core.
- Tx-3003. E-29283/40cm** **6550 ± 90**  
 $\delta^{13}C = +3.2\text{‰}$   
Same location as Tx-3001, 39 to 41cm in core.
- Tx-3004. E-29283/60cm** **12,260 ± 160**  
 $\delta^{13}C = +1.6\text{‰}$   
Same location as Tx-3001, 59 to 61cm in core.
- Tx-3005. E-29283/88cm** **30,600 ± 2400**  
 $\delta^{13}C = +2.1\text{‰}$   
Same location as Tx-3001, 88cm in core.
- Tx-3006. E-34631/47cm** **3870 ± 60**  
 $\delta^{13}C = +3.6\text{‰}$   
40km S of McLean's Town (26° 11' N, 78° 07' W), 45 to 50cm in core.
- Tx-3007. E-34631/7cm** **1790 ± 60**  
 $\delta^{13}C = +3.6\text{‰}$   
Same location as Tx-3006, 5 to 10cm in core.

*General Comment on Tx-2997 to Tx-3007 (MB):* data have been coupled with mineralogic, minor element, and stable isotope data with following results: 1) Holocene deposits have higher aragonite and strontium content than late Pleistocene, calcite-rich sediments; 2) Holocene deposition rates are approx 5 times greater than late Pleistocene rates; 3) major change in mineralogy and minor element concentrations occurs at 5000 to 7000 BP; 4a) isotope data from Holocene sediments are distinctly clumped ( $\delta^{18}O \cong -0.5$  to  $0.0$ ,  $\delta^{13}C \cong +3$  to  $+4$ ), and this range is indistinguishable from shallow carbonate sediments; 4b) isotope data from Pleistocene sediments are  $\delta^{18}O \cong +0.8$  to  $+1.6$ ,  $\delta^{13}C \cong +1.5$  to  $+2.8$ . These data strongly support hypothesis that when sea level flooded banktops, offbank transport of carbonate sediments began and now dominate deposition of carbonate sediments in deep channels. Roughly 80% of deep-sea sediments in NW Providence Channel is of banktop origin.

- Tx-3008. 764-F17** **80 ± 40**  
 $\delta^{13}C = +1.6\text{‰}$   
Deep water coral (BASE), 4km W of Memory Rock (26° 50' N, 79° 10' W).

- Tx-3009. 764/F17** **Ultra modern**  
 $\delta^{13}C = +2.1\text{‰}$   
Coral (TIPS), 4km W of Memory Rock, same location as Tx-3008.

*General Comment on Tx-3008 and Tx-3009 (MB):* dates demonstrate that this deep-sea (ahermatypic) coral grows quite rapidly. Coral, ca 50cm high, appears to have grown 50cm in 80 yr.

- Tx-3027. E-34652-15-SED** **4650 ± 70**  
 $\delta^{13}C = +3.7\%$   
NW Providence Channel (25° 56' N, 78° 31' W), 405m water depth,  
15cm below sediment-water interface.
- Tx-3028. E-34652-110-SED** **22,670 ± 290**  
 $\delta^{13}C = +3.2\%$   
Same location as Tx-3027, 110cm below sediment surface.
- Tx-3029. E-34652-88-RX** **17,210 ± 310**  
 $\delta^{13}C = +3.6\%$   
CaCO<sub>3</sub> rock fragments, same location as Tx-3027, 88cm below sedi-  
ment surface.
- Tx-3030. E-34652-140-SED** **26,250 ± 680**  
 $\delta^{13}C = +3.2\%$   
Same location as Tx-3027, 140cm below sediment surface.
- Tx-3031. E-34652-88-SED** **21,260 ± 490**  
 $\delta^{13}C = +3.3\%$   
Same location as Tx-3027, 88cm below sediment surface.
- Tx-3032. E-34652-140-RX** **20,880 ± 490**  
 $\delta^{13}C = +3.6\%$   
CaCO<sub>3</sub> rock fragments, same location as Tx-3027, 140cm below sedi-  
ment surface.
- Tx-3033. E-34658-20-SED** **8380 ± 110**  
 $\delta^{13}C = +3.5\%$   
NW Providence Channel (25° 54' N, 78° 32' W), 295m core depth,  
20cm deep in core.
- Tx-3034. E-34658-80-RX** **13,880 ± 150**  
 $\delta^{13}C = +3.5\%$   
CaCO<sub>3</sub> rock fragments, same location as Tx-3033, 80cm deep in core.
- Tx-3035. E-34664** **9970 ± 90**  
 $\delta^{13}C = +3.2\%$   
CaCO<sub>3</sub> rock, NW Providence Channel (25° 53' N, 78° 33' W), 200m  
water depth.

*General Comment on Tx-3027 to Tx-3035 (MB):* dates demonstrate that sediments and rock fragments of breccia zones are late Pleistocene, not Holocene; so modern chemical conditions are of little direct interest in lithification processes of these rock fragments. Rocks are 4000 to 5000 yr younger than surrounding sediment. Deposition rates of these breccia-filled cores are 8 to 15cm/1000 yr; this suggests mass movement of sediment as deposition process.

#### **Abaco Sound series, Bahamas**

Shell and sediment samples from 3 cores of lagoon sediments in Abaco Sound, NE margin of Little Bahama Bank near Great Abaco I., Bahamas. Coll 1977 by A C Neuman and subm by S Locker, Dept Marine Sci, Univ North Carolina, Chapel Hill. Cm figures are depths in core.

- Tx-3229. C7714-18-30** **5840 ± 80**  
*Anodontia alba* shells, ca 3.7km N of Marsh Harbour (26° 35' N, 77° 3.9' W), 489 to 493cm.
- Tx-3230. C7714-16-22** **4410 ± 100**  
*Chione cancellata* shells, ca 4.6km NW of Treasure Cay (26° 43.7' N, 77° 19.7' W), 415 to 417cm.
- Tx-3231. C7714-14-19** **8230 ± 260**  
*Anodontia alba* shells, ca 11km NW of Treasure Cay (26° 46.7' N, 77° 22.6' W), 424 to 427cm.
- Tx-3232. C7714-14-19** **4120 ± 100**  
*Chione cancellata* shells, same location as Tx-3231 above, 245 to 247cm.
- Tx-3233. C7714-14-19** **6940 ± 80**  
 CaCO<sub>3</sub> sediment, same location as Tx-3231, above, 420 to 422cm.
- Tx-3234. C7714-14-19** **6510 ± 90**  
 CaCO<sub>3</sub> sediment, same location as Tx-3231, above, 376 to 378cm.
- Tx-3235. C7714-18-30** **3800 ± 100**  
 CaCO<sub>3</sub> sediment, same location as Tx-3229, above, 410 to 413cm.
- Tx-3236. C7714-18-30** **3920 ± 90**  
 CaCO<sub>3</sub> sediment, same location as Tx-3229, above, 310 to 313cm.
- Tx-3237. C7714-14-19** **1190 ± 80**  
*Codakia orbicularis* shell, same location as Tx-3231, above, 69 to 73cm.
- Tx-3238. C7714-18-30** **1640 ± 50**  
 CaCO<sub>3</sub> sediment, same location as Tx-3229, above, 110 to 113cm.
- Tx-3239. C7714-18-30** **1060 ± 50**  
 CaCO<sub>3</sub> sediment, same location as Tx-3229, above, 10 to 13cm.
- Tx-3240. C7714-16-22** **2040 ± 140**  
 CaCO<sub>3</sub> sediment, same location as Tx-3230, above, 200 to 202cm.
- Tx-3241. C7714-16-22** **1110 ± 70**  
 CaCO<sub>3</sub> sediment, same location as Tx-3230, above, 100 to 102cm.
- Tx-3242. C7714-18-30** **1940 ± 70**  
 CaCO<sub>3</sub> sediment, same location as Tx-3229, above, 210 to 213cm.

*General Comment* (SL): sedimentation rate in core C7714-14-19 is ca 58cm/1000 yr and in Core C7714-16-22 is 101cm/1000 yr. In Core C7714-18-30 rate is 97cm/1000 yr with increase during last 1000 yr (as indicated by highest 3 dates, Tx-3238, -3239, -3242) to 300cm/1000 yr, comparing with Pb-210 data from Core C7714-16-22 indicating maximum rate of 300cm/1000 yr.

## II. GEOLOGIC SAMPLES

*United States***Tx-2561. MGM 1CD1, Nevada** **>40,000**

Wood from E wall MGM GRAND-Reno Pit site, 34m depth, Reno, Nevada (39° 31' 15" N, 119° 46' 30" W). NW 1/4, NE 1/4, Sec 18, T19N, R20E, MDBM. Coll 1976 and subm by J Bell, Nevada Bur Mines & Geol, Univ Nevada, Reno. *Comment* (JB): date supports interpretation that outwash deposit is Tahoe (early Wisconsinan) age.

*Mexico, Venezuela***Tlapacoya series, Mexico**

Dark lacustrine mud from Trench Beta, SE side Cerro Tlapacoya, N of Puebla toll rd ca 28km SE of Plaza de Constitucion, D F, Mexico (19° 17' 30" N, 98° 55' 00" W). Coll to establish ages for sediments used in paleomagnetic investigation. Coll 1973 by P W Lambert, U S Geol Survey, and subm by Lambert and Valastro, this lab.

**Tx-1784. Tlapacoya, 73L61** **13,180 ± 290**

NE side of trench, 23m from reference point.

**Tx-1913. Tlapacoya, 12/15/73/1** **14,540 ± 90**

N wall of trench, 30m from reference point. Date is average; sample split and 2 parts prepared and counted separately: 14,450 ± 120, 14,630 ± 130.

**Tx-1914. Tlapacoya 12/16/73/2** **14,450 ± 100**

NE wall of trench, 22.5 to 23.2m from reference point. Date is average; sample split as in Tx-1913: 14,210 ± 140, 14,690 ± 130.

*General Comment* (SV, Jr): paleomagnetic directions and <sup>14</sup>C dates do not support existence of geomagnetic field excursion formerly reported in 14,500 yr mud at Tlapacoya (Liddicoat and Coe, 1974; Liddicoat *et al*, 1979). Tx-1784 believed contaminated by root hairs.

**North-Central Coastal Range series, Venezuela**

Samples from Holocene outcroppings along N-central coast between Arrecifes and Borburata, DF, Venezuela. Coll to determine velocity of uplift of coastal range (Caribbean Mts). Coll 1975 and subm by C Schubert, Inst Venezolano Investigaciones Cientificas, Caracas, Venezuela. Last number in sample title refers to elev in m above sea level.

**Tx-2274. ARR-3, 0** **1170 ± 80**

Conglomeratic beach rock, on Taguao Bay, ca 1.5km W of Arrecifes (10° 33' N, 67° 08' W).

**Tx-2275. ARR-4, 0.5** **4480 ± 50**

Coral, same general loc as Tx-2274.

**Tx-2276. ARR-6, 0.5** **1020 ± 60**

Coral, on Taguao Bay, ca 1.7km W of Arrecifes (10° 33' N, 67° 08' W).

<b>Tx-2277. ARR-10, 0.5</b>	<b>970 ± 70</b>
Coral, on Taguao Bay, ca 1.8km W of Arrecifes (10° 33' N, 67° 08' W).	
<b>Tx-2278. ARR-11, 0.5</b>	<b>1040 ± 60</b>
Shell, same loc as Tx-2277, above.	
<b>Tx-2279. ARR-13, 0</b>	<b>Modern</b>
	$\delta^{14}\text{C} = +35.7 \pm 4.7\%$
Shell on La Salina Bay, ca 2.1km W of Arrecifes (10° 33' N, 67° 08' W).	
<b>Tx-2280. ARR-15, 0</b>	<b>2840 ± 80</b>
Conglomeratic beach rock, same loc as Tx-2279, above.	
<b>Tx-2281. ARR-18, 2</b>	<b>3260 ± 50</b>
Coral, on La Salina Bay, ca 3km W of Arrecifes (10° 33' N, 67° 08' W).	
<b>Tx-2282. ARR-19, 0.5</b>	<b>1860 ± 60</b>
Coral, same loc as Tx-2281, above.	
<b>Tx-2283. ARR-20, 0.5</b>	<b>1500 ± 50</b>
Coral, same loc as Tx-2281, above.	
<b>Tx-2325. CH-2, 15-18</b>	<b>310 ± 100</b>
Coral, ca 2km W of Puerto Colombia (10° 30' N, 67° 38' W).	
<b>Tx-2326. PAT-1, 0.5</b>	<b>4500 ± 80</b>
Coral, W side Patanemo Bay, ca 4.5km E Puerto Cabello (10° 30' N, 67° 58' W).	
<b>Tx-2327. PAT-3, 1.2</b>	<b>3620 ± 90</b>
Coral, W side Patanemo Bay (10° 30' N, 67° 58' W).	
<b>Tx-2328. PAT-5, 1.0</b>	<b>3380 ± 50</b>
Coral, same loc as Tx-2327, above.	
<b>Tx-2329. BOR-2, 0</b>	<b>3430 ± 70</b>
Coral, W end Borburata beach, ca 3.5km E Puerto Cabello (10° 30' N, 67° 59' W).	
<b>Tx-2330. BOR-5, 0</b>	<b>990 ± 50</b>
Shell, same loc as Tx-2329, above.	
<b>Tx-2331. BOR-6, 0</b>	<b>620 ± 70</b>
Coral, same loc as Tx-2329, above.	
<b>Tx-2332. BOR-10, 1</b>	<b>1310 ± 60</b>
Coral, ca 300m W Tx-2329, above.	

*General Comment (CS):* velocity of uplift of Coastal Range varies between 0.054, 0.061, and 0.0033cm/yr. However, real velocity of uplift probably

higher because age of coral and shell fragments contained in beachrock may be considerably older than rock itself. For report, see Schubert *et al* (1977).

III. PALEOBOTANICAL SAMPLES  
*Idaho, Washington*

**Hager Pond series, Idaho**

Peat samples from Core 1 (except as indicated) at Hager pond, mire ca 3.2km S of Nordman, Idaho (48° 36' N, 116° 57' W). Coll 1973 by R N Mack and subm by V M Bryant, Anthropol Research Lab, Texas A & M Univ, College Station, Texas. Figures in titles are depths in cm below surface.

<b>Tx-2103.</b>	<b>Hager Pond #31, 913-916</b>	<b>9110 ± 110</b>
	Core 2.	
<b>Tx-2104.</b>	<b>Hager Pond #32, 643-645</b>	<b>6980 ± 480</b>
<b>Tx-2105.</b>	<b>Hager Pond #33, 339-343</b>	<b>3030 ± 110</b>
<b>Tx-2108.</b>	<b>Hager Pond #36, 920-923</b>	<b>9510 ± 190</b>
	Core 2.	
<b>Tx-2110.</b>	<b>Hager Pond #38, 904-908</b>	<b>8280 ± 120</b>
<b>Tx-2113.</b>	<b>Hager Pond #41, 279-283</b>	<b>2940 ± 80</b>
<b>Tx-2115.</b>	<b>Hager Pond #43, 161-166</b>	<b>2670 ± 100</b>
<b>Tx-2116.</b>	<b>Hager Pond #44, 600-605</b>	<b>6630 ± 80</b>
<b>Tx-2119.</b>	<b>Hager Pond #47, 395-399</b>	<b>4310 ± 990</b>
<b>Tx-2121.</b>	<b>Hager Pond #49, 500-505</b>	<b>6390 ± 230</b>
<b>Tx-2673.</b>	<b>Hager Pond C-1, 760-771</b>	<b>7680 ± 40</b>
<b>Tx-2674.</b>	<b>Hager Pond C-1, 805-810</b>	<b>7960 ± 310</b>

*General Comment* (RNM): Mazama ash is between Tx-2121 and Tx-2116. Dates confirm and define environmental events of last 10,000 yr or more accurate time scale than in previous analyses of this mire (Hansen, 1939; Rumley, 1956). For complete report, see Mack *et al* (1978a).

**Simpsons Flats series, Washington**

Samples from Core 7 in mire in closed depression at Simpsons Flats on Colville Indian Reservation, 45km N of confluence of Sanpoil and Columbia Rivers (48° 25' N, 118° 15' W). Coll 1973 and subm by R N Mack, Dept Botany, Washington State Univ, Pullman, Washington. Figures in sample titles are depths in cm below surface.

<b>Tx-2214.</b>	<b>Simpsons Flats, 225-228</b>	<b>1970 ± 160</b>
	Fibrous peat.	
<b>Tx-2215.</b>	<b>Simpsons Flats, 264-268</b>	<b>2630 ± 160</b>
	Gyttja.	

<b>Tx-2216.</b>	<b>Simpsons Flats, 340-344</b>	<b>3260 ± 100</b>
	Gyttja.	
<b>Tx-2217.</b>	<b>Simpsons Flats, 411-414</b>	<b>4120 ± 170</b>
	Gyttja.	
<b>Tx-2218.</b>	<b>Simpsons Flats, 477-480</b>	<b>4380 ± 240</b>
	Gyttja.	
<b>Tx-2219.</b>	<b>Simpsons Flats, 526-529</b>	<b>4790 ± 230</b>
	Gyttja.	
<b>Tx-2220.</b>	<b>Simpsons Flats, 632-635</b>	<b>5850 ± 240</b>
	Gyttja.	
<b>Tx-2222.</b>	<b>Simpsons Flats, 840-845</b>	<b>10,000 ± 150</b>
	Wood.	
<b>Tx-2223.</b>	<b>Simpsons Flats, 848</b>	<b>10,010 ± 220</b>
	Wood.	
<b>Tx-2418.</b>	<b>Simpsons Flats, 710</b>	<b>9270 ± 280</b>
	Wood.	
<b>Tx-2470.</b>	<b>Simpsons Flats, 730-735</b>	<b>9560 ± 110</b>
	Wood.	

*General Comment* (RNM): Mazama ash was at 680cm. Dates give rate of vegetational change with recession of glacial ice and subsequent climatic change. Sharp discontinuity between Tx-2418 and Tx-2220 suggests no preserved records for events between ca 9000 and 6700 yr. For complete report, see Mack, Rutter, & Valastro (1978).

#### **Big Meadow series, Washington**

Gyttja from two cores from mire at Big Meadow on Meadow Creek, Pend Oreille Co, NE Washington (48° 43' N, 117° 33' W). Coll 1972 and subm by R N Mack. Numbers in titles refer to cm depths of samples in core. Samples listed in stratigraphic order from highest to lowest.

<b>Tx-2203.</b>	<b>Big Meadow, 76</b>	<b>1170 ± 100</b>
<b>Tx-2295.</b>	<b>Big Meadow, 149</b>	<b>2480 ± 130</b>
<b>Tx-2416.</b>	<b>Big Meadow, 253</b>	<b>3050 ± 70</b>
<b>Tx-2414.</b>	<b>Big Meadow, 307</b>	<b>3390 ± 100</b>
<b>Tx-2415.</b>	<b>Big Meadow, 363</b>	<b>4210 ± 110</b>
<b>Tx-2073.</b>	<b>Big Meadow, 563</b>	<b>8910 ± 80</b>
<b>Tx-2417.</b>	<b>Big Meadow, 581</b>	<b>9130 ± 320</b>



**Tx-2226. Big Meadow, 607** **10,460 ± 320**

*General Comment* (RNM): dates establish late Quaternary chronology of pollen record from Big Meadow and confirm relatively warmer climate than today between 9700 and 3330 BP. Present climatic conditions emerged ca 2400 BP. For complete report see Mack *et al* (1979).

**Waits Lake series, Washington**

Gyttja core samples from Core 1, S shore Waits Lake ca 10m from waterline, 2km W of Colville R Valley, Washington (48° 11' N, 117° 48' W). Subm to establish chronology for late Quaternary vegetational history in area. Coll 1972 and subm by R N Mack. Figures in titles are depths in cm below surface.

<b>Tx-2657.</b>	<b>Waits Lake, 125-135</b>	<b>3530 ± 80</b>
<b>Tx-2658.</b>	<b>Waits Lake, 275-294</b>	<b>6250 ± 100</b>
<b>Tx-2659.</b>	<b>Waits Lake, 315-330</b>	<b>7910 ± 100</b>
<b>Tx-2660.</b>	<b>Waits Lake, 440-456</b>	<b>8480 ± 260</b>
<b>Tx-2661.</b>	<b>Waits Lake, 570-590</b>	<b>9880 ± 150</b>
<b>Tx-2662.</b>	<b>Waits Lake, 660-684</b>	<b>9980 ± 160</b>
<b>Tx-2663.</b>	<b>Waits Lake, 830-850</b>	<b>11,950 ± 200</b>

*General Comment* (RNM): dates evidently unreliable in absolute sense since Tx-2660 and Tx-2659 bracket Mazama ash, dated elsewhere (Fryxell, 1965) at 6700 BP. Also Tx-2663 is above Glacier Peak ash, dated elsewhere (Mehring *et al*, 1977) between 11,200 and 11,300 BP. Present dates probably about 1300 yr old, due to contamination with older carbon. They provide useful within-the-core relative time frame. For complete report, see Mack *et al* (1978b).

**Mud Lake series, Washington**

Gyttja from two cores on NW margin of Mud Lake, 10km NE Conunully, Washington (48° 34' N, 119° 30' W). Numbers in title refer to cm depth in core. Coll 1972 and subm by R N Mack.

<b>Tx-2686.</b>	<b>Mud Lake, 254-260</b>	<b>8030 ± 150</b>
<b>Tx-2687.</b>	<b>Mud Lake, 326-332</b>	<b>8840 ± 940</b>
<b>Tx-2688.</b>	<b>Mud Lake, 355-360</b>	<b>9440 ± 120</b>
<b>Tx-2689.</b>	<b>Mud Lake, 424-466</b>	<b>11,300 ± 560</b>
<b>Tx-2690.</b>	<b>Mud Lake, 458-466</b>	<b>11,500 ± 560</b>

*General Comment* (RNM): series is below Mazama ash. For discussion, see Mack, Rutter, & Valastro (1979).

**Bonaparte Meadows series, Washington**

Peat from two cores from middle of fen, Bonaparte Meadows, 28km NW Republic, Washington (48° 54' N, 119° 02' W). Coll 1972 and subm by R N Mack. Numbers in title refer to cm depths in core.

<b>Tx-2676.</b>	<b>Bonaparte, 55-60</b>	<b>1480 ± 60</b>
<b>Tx-2677.</b>	<b>Bonaparte, 115-119</b>	<b>2170 ± 220</b>
<b>Tx-2678.</b>	<b>Bonaparte, 150-155</b>	<b>2440 ± 100</b>
<b>Tx-2679.</b>	<b>Bonaparte, 190-195</b>	<b>2570 ± 70</b>
<b>Tx-2680.</b>	<b>Bonaparte, 245-250</b>	<b>3340 ± 90</b>
<b>Tx-2681.</b>	<b>Bonaparte, 305-310</b>	<b>4780 ± 240</b>
<b>Tx-2682.</b>	<b>Bonaparte, 350-355</b>	<b>6750 ± 190</b>
<b>Tx-2683.</b>	<b>Bonaparte, 410-415</b>	<b>6790 ± 130</b>
<b>Tx-2882.</b>	<b>Bonaparte, 415-421</b>	<b>6810 ± 190</b>
<b>Tx-2881.</b>	<b>Bonaparte, 435-439</b>	<b>6870 ± 110</b>
<b>Tx-2883.</b>	<b>Bonaparte, 468-473</b>	<b>6930 ± 110</b>
<b>Tx-2884.</b>	<b>Bonaparte, 492-497</b>	<b>8300 ± 80</b>
<b>Tx-2684.</b>	<b>Bonaparte, 525-530</b>	<b>9000 ± 420</b>
<b>Tx-2685.</b>	<b>Bonaparte, 572-577</b>	<b>10,000 ± 220</b>

*General Comment* (RNM): Tx-2676 to Tx-2683 are between St Helens W and Mazama ash. Tx-2882 immediately above Mazama ash. Tx-2881 and Tx-2883 between 2 Mazama ash units; confirms earlier field evidence that Mazama ash represents 2 separate eruptions (Mack, Okazaki, & Valastro, 1979). Tx-2884, -2684, and -2685 below Mazama ash. For general discussion, see Mack, Rutter, & Valastro (1979).

#### *Massachusetts*

**Tx-2948. Ned's Ditch 9, Massachusetts 3020 ± 380**

Small twigs embedded in black and orange silt and fine sand, 305 to 310cm below water surface, Core 9, Ned's Ditch, center of oxbow lake of Connecticut R within city limits of Northampton, Massachusetts (42° 17' 30" N, 72° 37' 30" W). Coll 1975 and subm by M H Sackett, Dept Biol Sci, Smith Coll, Northampton, Massachusetts. *Comment* (MHS): date is oldest obtained from oxbow. From same core, 349cm, was Gx-4378, 710 ± 130 (Sackett, 1977, p 72); backcaving may have occurred at base of core.

#### **Granby Bog series, Massachusetts**

Peat samples from NE corner of Granby Bog, 0.8km S of Bachelor Brook Rd, 9.3km SSE of Amherst (42° 15' N, 72° 30' W). Coll 1977 by Sackett and Sailor and subm by M H Sackett.

**Tx-2945. Granby D-14 8520 ± 200**

902 to 927.4cm depth; near base of Pollen Zone C1.

**Tx-2946. Granby D-21 10,300 ± 370**

1205 to 1230cm depth; Pollen Zone A4.

*General Comment* (MHS): chronology of Granby Bog agrees well with other  $^{14}\text{C}$ -dated pollen diagrams in S New England (Beetham and Niering, 1961; Flint and Deevey, 1951; Totoket series in R, 1959, v 1, p 146-147).

## IV. ARCHAEOLOGIC SAMPLES

## Texas

**Tx-3173. Castner Range** **3080 ± 160**

Charcoal from Castner Range site (31:106:3:75), E side of Franklin Mt, El Paso, Texas (31° 52' 46" N, 106° 25' 45" W). From ash lens ca 35cm below surface; late San Pedro Cochise phase. Coll 1978 by M Thompson and subm by L Herrington, Texas Hist Comm, Austin, Texas. *Comment* (LH): agrees with other dates of comparable cultural assignment in Hueco Bolson (Thompson & Beckett, 1979).

**McDonald site series**

Charcoal samples from hearth, 87cm below surface, early component of McDonald site (X41HI171), E bank of Hackberry Creek, 2.1km WNW of Vaughn, Texas, in Aquilla Reservoir basin (31° 55' 12" N, 97° 11' 37" W). Coll 1978 and subm by S A Skinner, Archaeol Research Prog, Southern Methodist Univ, Dallas.

**Tx-3168. X41HI171/23/1** **780 ± 70**

**Tx-3169. X41HI171/23/2** **1010 ± 70**

*General Comment* (SAS): dates not in  $1\sigma$  agreement. Component includes Coles Creek Incised sherd; Tx-3169, agreeing with late part of date range usually assigned to this type, is probably nearer actual age than Tx-3168.

**George C Davis site**

Samples from George C Davis site (41CE19), early Caddo site E side Neches R valley, 9.6km SW of Alto, Cherokee Co, Texas (31° 35' N, 95° 10' W). Previous series from site are in R, 1970, v 12, p 626-629, and R, 1975, v 17, p 71-76. For extensive review of  $^{14}\text{C}$  dating of site, see Story and Valastro (1977).

**George C Davis village series**

Samples from hitherto uninvestigated part of site, NE of previously investigated portions. Coll 1978 and subm by D Creel, Dept Sociol & Anthropol, Texas A & M Univ, College Station. "Corrected" ages are corrected for  $\delta^{13}\text{C}$  and dendrochronology (Damon *et al*, 1974).

**Tx-3267. 41CE19/237** **560 ± 60**  
 $\delta^{13}\text{C} = -11.8\text{‰}$

Charred corn cob cupules and fragments, Unit 43, Feature 184-3. Corrected, 794 ± 66.

**Tx-3268. 41CE19/242** **1040 ± 230**  
 $\delta^{13}\text{C} = -26.9\text{‰}$

Woody charcoal from bottom of pit, Unit 45, Feature 185-4. Corrected, 984 ± 232.

- Tx-3269. 4ICE19/244A**  $740 \pm 70$   
 $\delta^{13}C = -27.1\text{‰}$   
 Woody charcoal, Unit 44, Feature 186-1. Corrected,  $700 \pm 80$ .
- Tx-3270. 4ICE19/244B**  $770 \pm 70$   
 $\delta^{13}C = -12.0\text{‰}$   
 Charred corn cob cupules, Unit 44, Feature 186-1. Corrected,  $970 \pm 80$ .
- Tx-3271. 4ICE19/246A**  $790 \pm 80$   
 $\delta^{13}C = -26.9\text{‰}$   
 Woody charcoal, Unit 46, Feature 187-3. Corrected,  $748 \pm 89$ .
- Tx-3272. 4ICE19/247**  $780 \pm 100$   
 $\delta^{13}C = -25.2\text{‰}$   
 Woody charcoal, Unit 46, Feature 187-5. Corrected,  $765 \pm 107$ .
- Tx-3273. 4ICE19/250A**  $950 \pm 80$   
 $\delta^{13}C = -26.4\text{‰}$   
 Woody charcoal, Unit 48, Feature 189-6. Corrected,  $930 \pm 89$ .
- Tx-3274. 4ICE19/250B**  $440 \pm 90$   
 $\delta^{13}C = -10.4\text{‰}$   
 Charred corn cob cupules, Unit 48, Feature 189-6. Corrected,  $700 \pm 104$ .
- Tx-3275. 4ICE19/254A**  $910 \pm 90$   
 $\delta^{13}C = -26.4\text{‰}$   
 Woody charcoal, Unit 45, Feature 185-11. Corrected,  $883 \pm 98$ .
- Tx-3276. 4ICE19/254B**  $550 \pm 60$   
 $\delta^{13}C = -10.1\text{‰}$   
 Charred corn cob cupules, Unit 45, Feature 185-11. Corrected,  $802 \pm 66$ .
- Tx-3307. 4ICE19/matrix sample 468**  $880 \pm 110$   
 $\delta^{13}C = -10.3\text{‰}$   
 Charred corn cob cupules, Unit 48, Feature 189-1. Corrected,  $1099 \pm 117$ .
- Tx-3308. 4ICE19/253B**  $620 \pm 100$   
 $\delta^{13}C = -25.6\text{‰}$   
 Charred hickory nut shell, Unit 43, Feature 184-4. Corrected,  $625 \pm 104$ .
- Tx-3309. 4ICE19/238**  $1170 \pm 100$   
 $\delta^{13}C = -20.4\text{‰}$   
 Charred hickory nut fragments, Unit 45, Feature 185-8. Corrected,  $1215 \pm 105$ .
- Tx-3310. 4ICE19/239**  $610 \pm 100$   
 $\delta^{13}C = -11.8\text{‰}$   
 Charred corn cob cupules, Unit 45, Feature 185-1. Corrected,  $828 \pm 104$ .

**Tx-3311. 41CE19/246B** **1140 ± 160**  
 $\delta^{13}C = -26.6\%$   
Probable charred cane, Unit 46, Feature 187-3. Corrected, 1100 ± 163.

**Tx-3312. 41CE19/253A** **1190 ± 80**  
 $\delta^{13}C = -27.2\%$   
Probable charred cane, Unit 43, Feature 184-4. Corrected, 1128 ± 87.

*General Comment* (DC): all samples except Tx-3268 are from small charcoal-filled features which may be smudging pits of short-term use. Dates generally agree with previous dating of early Caddoan occupation at Davis site (Story & Valastro, 1977) and appear to relate mostly to later part of this occupation, although there is some indication of early occupation as well.

#### **George C Davis F193-1 series**

Wood charcoal from fill of pit, Feature 193-1, in Unit 62, W of Mound C, George C Davis site. Coll 1978 and subm by P Thurmond and U Kleinschmidt, Texas Archeol Research Lab, Univ Texas, Austin.

**Tx-3399. Davis F193-1, 299** **990 ± 60**  
Zone 4.

**Tx-3400. Davis F193-1, 255** **1020 ± 60**  
Zone 5.

**Tx-3401. Davis F193-1, 288** **800 ± 40**  
Zone 10 (deepest).

*General Comment* (PT, UK): pit fill was distinctly stratified, but matching sherds from different zones show that deposition was all one event. Occurrence of youngest date (Tx-3401) in deepest zone supports this conclusion. If Tx-3401 represents date of deposition, event was late in occupation of site.

#### *Arkansas*

#### **Amos site series**

Samples from Late Caddoan component, Amos site (3MN62), Upper Caddo Valley, 0.4km SW of Caddo Gap, Montgomery Co, Arkansas (34° 23.5' N, 93° 37.5' W). Coll 1976 by F Schambach and subm by A M Early, Arkansas Archeol Survey, Henderson State Univ, Arkadelphia, Arkansas.

**Tx-2858. 76-690-62** **230 ± 50**  
Woody twigs from Feature 4, small pit filled with twigs, nut hulls, and possible cultigens. Unit N18W42, 35cm depth. *Comment* (AME): date too recent to refer to Late Caddoan component.

**Tx-2859. 76-690-127-1** **440 ± 70**  
Wood charcoal from concentration of organic refuse on perimeter of Feature 3, Unit N16W44. *Comment* (AME): date appropriate for Late Caddoan component.

**Boydell site series**

Carbonized log samples from Boydell site (3AS58), Bartholomew phase Plaquemine, E side Bayou Bartholomew, in Boydell, Arkansas (30° 22' N, 91° 29' W). Coll 1977 and subm by P Stacy, Arkansas Archeol Survey, Univ Arkansas, Monticello.

**Tx-2885. Boydell 77-764-1** **790 ± 50**

S central part of mound, 1.2m below surface; Feature 1.

**Tx-2886. Boydell 77-764-27** **690 ± 60**

N side Feature 2, ca 2m below surface.

**Tx-2887. Boydell 77-764-41** **750 ± 80**

W side Feature 2, ca 2m below surface, with Burial 5.

*General Comment* (JM House): dates help confirm Rolingson's (1976, p 119) estimate of AD 1200 to 1400 for Bartholomew Phase of Plaquemine, and strengthen proposed chronologies for Winterville (Brain, 1969, p 279-282), lower Yazoo (Phillips, 1970, p 955-961), and Tensas (Hally, 1966).

*Oklahoma*

**Tx-3248. 34SM-20/#2** **1270 ± 60**

Charcoal and charred nut hulls from Block D, Level 3, Roulston-Rogers site (34Sm-20), on ridge N side Little R, ca 4.8km NW Sasakwa, Seminole Co, Oklahoma (34° 59' 70" N, 96° 35' 60" W). Component A, Plains Woodland. Coll 1972 and subm by R Drass, Oklahoma Archaeol Survey, Norman. *Comment* (RD): date as expected; agrees with UGa-2510, 1310 ± 105, from same component (Drass, pers commun).

**Blessingame site series**

Samples from Blessingame site (34Pu-74), Archaic and early Caddoan site in Jackfork Valley 5.6km N of Clayton, in Clayton Reservoir basin, Pushmataha Co, Oklahoma (34° 38' 25" N, 95° 21' 20" W). Coll 1978 and subm by C Lintz, Archaeol Research & Management Center, Univ Oklahoma, Norman. UGa dates cited are from Lintz (pers commun). Comments by CL.

**Tx-3280. 34Pu-74, #2** **1010 ± 50**

Charred wood from roof fall, Structure 1, Sample C-6, Level 3, Sq B35-17. Early Caddo. *Comment*: sample pretreated at Texas lab, split, half-dated at Univ Georgia: UGa-2721, 890 ± 65. Georgia date not inconsistent with present date; both dates consistent with early Caddo materials. Another date from same structure is UGa-2532, 185 ± 60, anomalously young. See also Tx-3283, below.

**Tx-3281. 43Pu-74, #4** **1000 ± 50**

Charred wood, roof fall post, Structure 2, Level 2, Sq C64-11. Early Caddo. *Comment*: sample pretreated at Texas lab, split, half-dated at Univ Georgia: UGa-2720, 790 ± 65, later than present date, but both dates consistent with early Caddo assignment. Another date from same structure is UGa-2533, 565 ± 60, anomalously young.

**Tx-3282. 43Pu-74, #8** **500 ± 40**

Charred wood from fill of Feature 78-9, rock hearth, Level 2, S half Sq A21-18. *Comment*: UGa-1518, 220 ± 100, from same feature; dates do not agree.

**Tx-3283. 43Pu-74, #7** **530 ± 50**

Charred cane from roof fall, Structure 1, Level 4, Sqs B35-11, B35-9, B35-10, B35-12. *Comment*: date significantly younger than other dates from this structure (see comment for Tx-3280, above). *Lab Comment*: no  $\delta^{13}\text{C}$  determination made. Anomalous date possibly due to fractionation in cane; our experience is that some species of cane fractionate, others do not. Present sample not identified botanically.

**Tx-3284. 43Pu-74, #10** **1920 ± 60**

Charred wood, probably assoc with Feature 78-6, rock hearth, Level 2 (10 to 20cm), Sq A20-14. *Comment*: date inexplicably early; stratigraphically equivalent to Feature 78-9 (Tx-3282, above, and UGa-1518, 220 ± 100) and is stratigraphically above UGa-2534, 175 ± 175.

*North Carolina***Parker site series**

Charcoal samples from Parker site (31Dv4), late Woodland site 250m S of Yadkin R on Horseshoe Neck, ca 11km NW of Churchland, North Carolina (35° 50' N, 80° 31' W). Coll 1972 and subm by J N Woodall, Mus of Man, Wake Forest Univ, Winston-Salem, North Carolina.

**Tx-2818. Parker A** **970 ± 80**

From postmold, Sq N95/E98, Level 3, 30 to 39cm below surface.

**Tx-2819. Parker B** **1340 ± 60**

Sq N78/E100, Level 3, 30 to 45cm below surface.

**Tx-2820. Parker C** **120 ± 260**

Trash pit in Sq N95/E100, 99.33 to 99.36m above datum. Pit had late Woodland sherds and points, 2 late Archaic points, mussel shells, animal bones.

*General Comment* (JNW): Tx-2818 and -2819 agree with evidence of Late Archaic point assoc that net-impressed pottery (and large Yadkin R sites with this ware) is not protohistoric in age. Reason for late date of Tx-2820 not apparent, but fill of trash pit was dark and intrusions might have been present without being detected.

*Ohio***Tx-2374. Eddie Paul Rockshelter** **660 ± 50**

Eddie Paul Rockshelter, on top of hill W of Stump Run, 1.6km S of Frazeyburg, Ohio (40° 05' N, 82° 07' W). Earliest occupation of site, assoc with Late Woodland occupation including triangular projectile points and Peters cord-marked pottery. From 0.55m depth, lowest occupation level. Coll 1972 by J Carskadden and subm by J P Morton, Dept

Geol Sci, Univ Texas, Austin. *Comment* (JPM): date later than expected; should be earlier than Philo phase (see Richards site series, below) which has shell-tempered pottery. Reason for late date unknown.

**Tx-2462. Merry's Cave** **2290 ± 50**

Charcoal from Merry's Cave site, on Salt Creek, 1.6km N of junction with White Eyes Creek, 8km WNW of Chandlersville, Ohio (39° 55' N, 81° 52' W). From layer D-3, lowest level where pottery occurs: Early Adena. Coll 1969 by J Carskadden and subm by J P Morton. *Comment* (JPM): date recent for Early Adena.

**Richards site series**

Richards site (HA-13), Middle Fort Ancient aspect, Philo phase, on N bank Muskingum R, 0.8km W of Duncan Falls (39° 52' N, 81° 55' W). Coll 1975 by Carskadden and subm by J P Morton.

**Tx-2344. Richards HA-13-A** **660 ± 60**

Bottom of Fire Pit A, 0.76m below plow zone; assoc with Philo Punctate pottery.

**Tx-2345. Richards HA-13-B** **680 ± 50**

Bottom of Fire Pit B, 0.6m below plow zone.

**Tx-2346. Richards HA-13-C** **600 ± 70**

Bottom of Fire C, 0.76m below plow zone.

*General Comment* (JPM): dates consistent with previous estimates for age of Philo phase.

**Hilltop Mound Group series**

Hilltop Mound Group (HA-3), Adena and Late Hopewell site on N bank of Muskingum R, on ridge above Richards site 0.8km W of Duncan Falls (39° 52' N, 81° 55' W). Coll 1975 by J Carskadden and subm by J P Morton.

**Tx-2347. Hilltop Mounds, HA-3D-1** **2990 ± 80**

Mound D, Feature 1, central fire basin on primary mound, Mound D. *Comment* (JPM): most assoc are Late Hopewell, but Early Woodland pottery was nearby; date indicates Early Woodland.

**Tx-2373. Hilltop Mounds, HA-3B-1** **1650 ± 60**

Charred log in fire basin on floor of primary mound, Mound B. *Comment* (JPM): date consistent with Late Hopewell.

**Tx-2375. Hilltop Mounds, HA-3E-1** **2160 ± 60**

From living area of House E, Late Adena. *Comment* (JPM): date consistent with Late Adena and Early Hopewell.

*Washington*

**Tx-3304. Miller site #55, Washington** **2400 ± 110**

Charcoal fragments from Miller site (45FR5) on Strawberry I, in Snake R, 6.4km upstream from its mouth, Franklin Co, Washington (46°



14' N, 118° 59' W). Side of 43.5 E wall, 59.4S to 60.0S, alt 103.60 to 103.70cm. Coll 1978 and subm by R R Mierendorf, Washington State Univ, Pullman, Washington. *Comment* (RRM): date assoc with non-housepit occupation; underlies large housepit occupation.

*Montana*

**Tx-3066. Iron Jaw Wilcox Burial** **1790 ± 50**

Wood charcoal from Iron Jaw Wilcox Burial (24RB93), on first alluvial terrace above Iron Jaw Creek, ca 6.4km S of Hathaway, Montana (46° 13' 38" N, 106° 13' 11" W). Above and among bones of primary burial, 2 to 30cm subsurface. Coll 1978 by J Clark and subm by R A Teegarden, U S Bur Land Management, Miles City, Montana. *Comment* (RAT): no grave goods assoc; <sup>14</sup>C date allows placement of burial in time.

**Benson's Butte series**

Charcoal from hearths and bone from rock-walled dwelling in Benson's Butte site (24BH1726; Fredlund, 1979). Late Prehistoric site on spring fork of Young's Creek, tributary of Tongue R, Crow Indian Reservation, Big Horn Co, Montana, ca 32km N of Sheridan, Wyoming (45° 01' 34" N, 107° 01' 13" W). Coll and subm 1977, 1978 by L B Fredlund, Montana Tech Alumni Foundation, Mineral Research Center, Butte, Montana. For previous dates, see R, 1977, v 19, p 317. Cm figures are depths below surface.

**Tx-2795. Benson's Butte #6** **940 ± 60**  
Charcoal, Feature 16, 35 to 40cm, 1S38W.

**Tx-2796. Benson's Butte #7** **1510 ± 60**  
Charcoal, Feature 18, 40 to 50cm, 2N/3N 37W/38W.

**Tx-2797. Benson's Butte #8** **4230 ± 50**  
Charcoal, Feature 20, 60cm, 6N38W.

**Tx-2798. Benson's Butte #9** **1140 ± 50**  
Charcoal, Feature 20, 40 to 50cm, 6N38W.

**Tx-3111. Benson's Butte #10** **1000 ± 90**  
Bone, Feature 19, 40 to 60cm, various locations.

**Tx-3112. Benson's Butte #11** **1770 ± 200**  
Bone, Feature 19, 40 to 60cm, various locations.

*General Comment* (LBF): charcoal dates fit well within expected range of early Late Prehistoric period, except for Tx-2797, which is inexplicably early. Bone date, Tx-3111, consistent with major occupation of site; however, Tx-3112 thought to be more realistic date for structure as living surface is stratigraphically below latest occupation. For further details see Fredlund (1979).

## Idaho

**Hatwai site series**

Charcoal from Hatwai site (10NP143), at confluence of Hatwai Creek and Clearwater R, ca 7km E of Lewiston, Idaho (46° 26' 30" N, 116° 54' 00" W). Coll 1978 by Green, Ames, and others and subm by J P Green and K M Ames, Dept Sociol, Anthropol, and Criminal Justice Admin, Boise State Univ, Boise, Idaho. Comments by JPG and KMA.

**Tx-3081. 10NP143-77 9320 ± 1830**

Very small samples from remnant sand layer over alluvial bar gravel, 9.6-11.8N/90-91E, alt 232.6 to 232.8cm. Early Alluvium (Qae) (Hammett, 1976). *Comment:* dates overbank sand deposition in broad meander at midpoint bar position. Stratigraphically below Tx-3082 and -3083, below.

**Tx-3082. 10NP143-78 8560 ± 520**

Truncated surface under upper gravel, 10-15N/89-90E, alt 232 to 232.6cm. Early Alluvium (Qae). *Comment:* dates upper limit for truncation of overbank chute sediments and start of period of increased stream competence. Dates same episode as WSU-1828, 6165 ± 210 (Ames, pers commun); present date in better agreement with geologic evidence. Stratigraphically above Tx-3083, below.

**Tx-3083. 10NP143-17/78 9280 ± 110**

In overbank channel, 13-15N/89-90E, alt 321.8m. Mid-point bar location. *Comment:* dates start of overbank chute deposition; dates upper limit for truncation of underlying deposits. Geologically same as WSU-1840, 7860 ± 90 (Ames, pers commun); present date in better agreement with geologic evidence. Early Alluvium (Qae). Unconformably overlies Tx-3081; underlies Tx-3082.

**Tx-3084. 10NP143-87 6240 ± 100**

Bottom of channel cut into Early Alluvium, 13-14N/259E, alt 231.85 to 231.90cm. *Comment:* dates upper limit for cut. Dates cut and fill episode represented by Overbank "A" set, chute fill. Overbank episode records vigorous Clearwater R flow in Altithermal period. Upper point bar location; correlates with units at mid and lower bar positions.

**Tx-3085. 10NP143-102 4310 ± 70**

Organic fraction of Overbank Laminae "C" set, Unit B, 12.5-13.6N/259E, alt 232.78 to 232.81m. *Comment:* dates episode of increased Clearwater R flow, roughly co-eval with Tucannon phase pit houses (Tx-3088, -3263, below). Upper point bar location, correlates with units at mid and lower bar positions. Middle Alluvium unit (Qam).

**Tx-3086. 10NP143-64 9160 ± 230**

Occupational surface in Early Alluvium (Qae) unit, 9-12N/56-60E, alt 231.9 to 232.1cm. *Comment:* laterally equivalent to Tx-3083, above; dates agree. Dates upper limit for lower point bar gravels containing Windust phase artifacts (Leonhardy and Rice, 1970).

**Tx-3088. 10NP143-103 4120 ± 110**

Small branch or house timber, lower floor House 2; 15.35-15.40N/141.18-141.40E, alt 233.25cm. *Comment:* pit house of Tucannon phase (Leonhardy and Rice, 1970); below upper floor of house, from which came Tx-3092, -3264, below.

**Tx-3089. 10NP143-70A 360 ± 60**

From intrusive pit, Feature 90, dug into House 3, Tucannon phase pit house, 2.05-3.05N/59.45E, alt 234cm. *Comment:* dates trash in pit.

**Tx-3090. 10NP143-4A-5 150 ± 70**

From pit, Feature 2, 26.20-27.25S/32W, alt 234cm. *Comment:* small side-notched points assoc; latest precontact date for site use.

**Tx-3091. 10NP143-37 2270 ± 150**

Buried soil surface on upper Tucannon sediment, 18-28S/32W, alt 232.6 to 232.7cm. *Comment:* Middle Alluvium; composite sample from along contact, Qal position; correlates with paleosol developed on Qam.

**Tx-3092. 10NP143-119 3420 ± 380**

Composite sample from small area on upper floor House 2, 14-16N/141-145E, alt 233.4 to 233.5cm. *Comment:* assoc with Tx-3264, below; dates agree closely. Appropriately later than Tx-3088, above, on lower floor of same house. See Tx-3264, below, for further comments.

**Tx-3158. 10NP143-217 9850 ± 870**

Intergravel sand lens at lower point bar position; 10-12N/56-60E, alt 230.94 to 231.38cm. *Comment:* assoc with Windust phase artifacts, post-Missoula flood gravels. Stratigraphically inconsistent with Tx-3159, below; present date probably too recent.

**Tx-3159. 10NP143-187 10,820 ± 140**

Lower point bar gravel unit, 8-10N/51.3-54.0E. *Comment:* Windust phase artifacts directly assoc; first post-Missoula flood occupation. Overlies Tx-3158, above, which has more recent date; present date believed more reliable because consistent with those from Marmes Rock Shelter for initial occupation (Rice, 1972).

**Tx-3160. 10NP143-216 10,110 ± 720**

Intergravel sand lens, 14-16N/124-127E, alt 232.64 to 233.03cm. Mid-point bar position. *Comment:* dates period of high stream competence. Artifacts in overlying gravel foreset unit.

**Tx-3161. 10NP143-283 5450 ± 120**

Organic fraction of Overbank Lamina "B", from buried channel at intersection of lower point bar and creek; 0.5-1.0N/48-50E, alt 231 to 231.38cm. *Comment:* dates episode of increased stream competence. Gives median age for ashy (Mazama) fan deposits derived from Hatwai Creek.

**Tx-3262. 10NP143-261 5550 ± 220**

Composite sample from fill of large pit intrusive into fill of House 1; 10-12N/128-130E, alt 233 to 233.1cm. *Comment:* stratigraphically more recent than Tx-3263, below, and WSU-1842, 3330 ± 70; present date must be too old for age of pit.

**Tx-3263. 10NP143-271 4340 ± 90**

Composite sample from floor of House 1, 10-12N/128-130E, alt 232.9 to 233cm. *Comment:* agrees with Tx-3088, above, in dating first pit house here, and provides support in dating House 5 at Alpowai site (Brauner, 1976). Hatwai and Alpowai are thus earliest villages on Columbia Plateau.

**Tx-3264. 10NP143-186 3440 ± 110**

Composite sample from small pit assoc with upper floor of House 2; 14.7-15.4N/142.18-143.05E, alt 232.82 to 233.20cm. *Comment:* agrees closely with Tx-3092, above. These 2 dates, and dates on House 1 (WSU-1842, 3330 ± 70; WSU-1878, 3130 ± 90; Ames, pers commun) and House 4 (WSU-1892, 3240 ± 90; Ames, pers commun) date second major house construction episode at site, Tucannon phase.

**Tx-3265. 10NP143-117 8300 ± 1310**

Small composite sample on occupational surface in late glacial over-bank sediment; 7-12N/51-60E, alt 231.84cm. *Comment:* assoc with early Cascade phase material. Early Alluvium (Qae). Duplicate sample of Tx-3086, above, with which it agrees.

**Tx-3266. 10NP143-229 8660 ± 1660**

Small composite sample assoc with upper gravel veneer on lower point bar, Feature 63, 6-12N/51-60E, variable alt. *Comment:* Windust phase cultural material assoc. Laterally equivalent to episode dated by Tx-3082; dates agree.

*General Comment on Hatwai series:* series provides first good set of dates for an open Windust phase site, establishes initiation of pit house villages on Columbia Plateau at 4300 to 4000 BP, and provides chronologic base for developing Clearwater R alluvial sequence.

*Curecanti Project, Colorado*

Samples from sites in Curecanti area, Blue Mesa Reservoir Basin, on Gunnison R, W of Gunnison, Colorado. Coll 1978 by R T Euler and subm by M Steiger, Midwest Archeol Center, Lincoln, Nebraska.

**5GN191 series**

Charcoal from Site 5GN191, extensive lithic deposit with slab-lined firepits, points including variant type of Pinto Basin; S bank of Gunnison R, ca 22.5km W of Gunnison (38° 28' N, 107° 08' W).

**Tx-3149. #19 8550 ± 100**

Feature 11, unlined firepit.

**Tx-3152. #16** **5810 ± 120**  
 Feature 3, slab-lined firepit.

**Tx-3155. #18** **5690 ± 170**  
 Feature 6, slab-lined firepit.

*General Comment (MS):* dates earlier than expected; all are before end of Altithermal.

#### **5GN205 series**

Charcoal from site 5GN205, in Elk Creek development area, ca 0.8km N of Blue Mesa Reservoir, ca 24km W of Gunnison (38° 28' N, 107° 10' W). All samples are from same stratigraphic level, 20 to 30cm below present ground surface.

**Tx-3150. #420/422** **4430 ± 300**  
 Feature 1, circular ash stain (probable habitation structure), general fill, ca 3m diam.

**Tx-3151. #443** **4560 ± 80**  
 From hearth on edge of *in situ* lithic concentration.

**Tx-3154. #297/298** **9800 ± 830**  
 Same location as Tx-3151, above.

**Tx-3156. #442** **7060 ± 110**  
 From poorly defined charcoal stain, 4m NW of Feature 1.

**Tx-3157. #437** **4270 ± 90**  
 Sample from possible cribbing from Feature 1.

*General Comment (MS):* dates from Feature 1 consistent; earlier than expected.

**Tx-3153. 5GN200, Catalog #1** **4520 ± 120**

Charcoal from Site 5GN200, within Elk Creek development area (see 5GN205 series, above). From possible shallow hearth in test pit. *Comment (MS):* consistent with most other dates from similar components in Curecanti area.

#### *South America*

#### **Perijá series, Venezuela**

Charcoal samples from 2 sites in Perijá Dist, state of Zulia, Venezuela. Coll 1976 and subm by E Wagner, Dept Antropol, IVIC, Caracas, Venezuela.

**Tx-2608. Perijá, Caño Pescado** **9140 ± 140**  
 From Trench A, level 0.25 to 0.5m, Caño Pescado site, on riverbank where Caño Pescado enters Rio Palmar (10° 41' N, 72° 26' W).

**Tx-2609. Perijá, Berlin #1** **490 ± 70**  
 Trench V, surface to 0.25m, Berlin site, in valley between Caño Pescado and Caño Colorado, ca 1.5km from Rio Palmar (10° 38' N, 72° 25' W).

**Tx-2610. Perijá, Berlin #2** 7710 ± 700

Same as Tx-2609, level 0.25 to 0.5m.

**Tx-2611. Perijá, Berlin #3** 8420 ± 970

Same as Tx-2609, Level 0.5 to 1m.

*General Comment (EW)*: assoc ceramics are similar to those at El Diluvio site (Tx-2409 to -2413; R, 1978, v 20, p 265), which were widely varied. Present dates much too old to date occupations, except Tx-2609 which is too young. Samples seem to consist partially of coal from Tertiary formations of Perijá area.

#### La Galgada series, Peru

Carbonized wood from pre-ceramic temples, La Galgada site, 1km S of La Galgada village on E bank of Rio Tablachaca, Prov Pallasca, Peru (8° 28' S, 78° 9' W). Coll 1978 and subm by T Grieder, Art Dept, Univ Texas, Austin.

**Tx-3166. C1-J6** 3660 ± 80

Fire pit in Floors 3, 5, 7, Sec C1, Sq J6.

**Tx-3167. D1-D3** 3820 ± 60

Fire pit in Floor 25, Sec D1, Sq D3.

*General Comment (TG)*: dates provide rough time range for pre-ceramic temples.

#### Vegas series, Ecuador

Shell (*Anadara tuberculosa*) and human bone from Vegas culture type site midden, on low hill 1km SW Santa Elena, Santa Elena Peninsula, Prov Guayas, Ecuador (02° 13' S, 80° 52' W). Coll 1977 and subm by K E Stothert, Paleo-Indian Proj, Central Bank of Ecuador, 723 E Woodlawn, San Antonio, Texas.

**Tx-3313. OGSE-80 #1** 7440 ± 100

Shell, Quad G-H/8-9, 90 to 95cm level.

**Tx-3314. OGSE-80 #2** 7150 ± 70

Shell, Quad G-H/8, 95 to 100cm level.

**Tx-3315. OGSE-80 #3** 8170 ± 70

Shell, Quad G-H/8-9, 105 to 110cm level.

**Tx-3316. OGSE-80 #4** 9550 ± 120

Shell, Quad G-H/8, 140cm level.

**Tx-3318. OGSE-80 Moved bones** 6750 ± 150

Bone from cemetery in midden. *Lab Comment*: date is on apatite fraction.

**Tx-3413. OGSE-80, Feature 24** 8250 ± 120

Bone from cemetery in midden. *Lab Comment*: date is on apatite fraction.

*General Comment* (KES): shell dates in fairly good stratigraphic order excepting Tx-3313 and -3314; dates confirm previous dates from midden (L-1042A,  $8600 \pm 200$  BP; L-1042F,  $7600 \pm 100$  BP; I-10,097,  $8810 \pm 395$  BP; Stothert, pers commun). Bone dates confirm burials made while midden accumulating; Tx-3318 probably corresponds to refuse levels that have eroded from upper level of midden.

*Yugoslavia*

**Stobi mortar, Series I, Yugoslavia**

Samples of mortar ( $\text{CaCO}_3$ ) from masonry buildings at Stobi, Hellenistic and Roman site at junction of Crna and Vardar Rivers, S of Titov Veles, Macedonia ( $41^\circ 33' \text{ N}$ ,  $21^\circ 59' \text{ E}$ ). Previous dates from Stobi are in R, 1975, v 17, p 96-98, and 1977, v 19, p 323. Present series represents first work on application of modified technique for dating of mortar, in which aggregate is removed and only first fraction of  $\text{CO}_2$  gas evolved from mortar is used (for details of technique see Valastro, 1975; Folk and Valastro, 1975; 1976). Tx-1431 and -1940 to -1944 coll 1973 by Davis (except as noted) and represent 1st phase of project. These dates have been reported and discussed in sources just cited (some dates are slightly different here because of being rounded to nearest 10 yr). Tx-2488 to -2494 coll 1974-5 by Davis, reported here for 1st time. Most samples split and parts prepared and counted independently. In such cases, date is average and dates of parts are given in description. "Corrected dates" are corrected for  $^{13}\text{C}/^{12}\text{C}$  and dendrochronology (Damon *et al*, 1974). Subm by J R Wiseman, Dept Classical Studies, Boston Univ, Boston, Massachusetts, and E M Davis; comments by JRW and EMD.

**Tx-1431. Stobi Cent Bas, Folk mortar  $1870 \pm 180$**

Small sample for preliminary experiment in mortar dating. Floor 1, narthex of Central Basilica (formerly called Synagogue Basilica). Coll 1971 by R L Folk. *Comment*: archaeol date of building construction, AD  $460 \pm 30$  ( $1490 \pm 30$ BP), but mortar might be as much as a century later. Mortar  $^{14}\text{C}$  date much earlier, but this preliminary experiment justified continuing work on mortar dating.

**Tx-1944. Stobi, Cent Bas, Mortar 11  $1600 \pm 60$**   
 $\delta^{13}\text{C} = -15.8\%$

Same provenience as Tx-1431, above,  $1628 \pm 50$ ,  $1560 \pm 90$ . *Comment*: corrected date,  $1510 \pm 60$ , agrees with archaeol date of building construction,  $1490 \pm 30$ BP; suggests mortar does not refer to time after building was abandoned, as had been suspected.

**Tx-1941. Stobi, Theater 2X73, Mortar 4  $1730 \pm 40$**   
 $\delta^{13}\text{C} = -9.3\%$

Theater, foundation of analemma in E parodos,  $1740 \pm 60$ ,  $1720 \pm 60$ ,  $1730 \pm 60$ . *Comment*: corrected date is  $1690 \pm 40$ .

**Tx-1942. Stobi, Theater 7X73, Mortar 9  $1720 \pm 50$**   
 $\delta^{13}\text{C} = -8.2\%$

Theater, foundation of S wall of 1st radial corridor of cavea, next to

W parodos, 1738 ± 80, 1690 ± 70, 1715 ± 70. *Comment:* corrected date is 1700 ± 50.

**Tx-2488. Stobi, Theater 1X74** **1950 ± 60**  
 $\delta^{13}C = -14.9\%$

Theater, E Porch II, from core of porch of scene building. *Comment:* corrected date is 1850 ± 75.

**Tx-2489. Stobi, Theater 4X74** **1780 ± 50**  
 $\delta^{13}C = -6.8\%$

Theater, core of W wall of center radial corridor, just N of outer circular corridor. *Comment:* corrected date is 1775 ± 70.

*General Comment on Tx-1941, -1942, -2488, -2489:* samples are all from same construction episode in early 2nd century AD, ca 1840 BP. Average of 4 corrected dates is 1755 ± 30. Tx-1941, -1942 agree with each other but are more recent than archaeol date. Tx-2488 agrees well with archaeol date. Tx-2489 is intermediate.

**Tx-1943. Stobi, E Bas, Mortar 10** **1660 ± 50**  
 $\delta^{13}C = -19.2\%$

Episcopal Basilica, foundation of S wall, 1680 ± 130, 1627 ± 70, 1670 ± 60, 1640 ± 70. *Comment:* corrected date is 1550 ± 50.

**Tx-2490. Stobi, E Bas 45X75** **1600 ± 70**  
 $\delta^{13}C = -10.6\%$

Episcopal Basilica, foundation of S stylobate at E end. *Comment:* corrected date is 1525 ± 85.

**Tx-2491. Stobi, E Bas 46X75** **1800 ± 80**  
 $\delta^{13}C = -18.3\%$

Episcopal Basilica, foundation of N wall near E end. *Comment:* corrected date is 1625 ± 85.

*General Comment on Tx-1943, -2490, -2491:* samples are all from construction Phase I, 2nd quarter or middle of 5th century AD, ca 1510 ± 20 BP. Average of 3 corrected dates is 1570 ± 40. Dates agree with one another within 1σ, and Tx-1942 and -2490 agree with archaeol date; Tx-2491 is early.

**Tx-1940. Stobi, CWE 4X73, Mortar 1** **2040 ± 50**  
 $\delta^{13}C = -16.2\%$

From horizontal layer of mortar in deposits against exterior of E wall (Wall 15) of Casa Romana, alt 131.20 to 131.44m; later than wall, 2015 ± 80, 2051 ± 60. Coll 1972 by J F Cherry. *Comment:* corrected date is 1880 ± 60, much earlier than archaeol date of 4th century AD based on pottery in strata above and below mortar layer; secondary deposition suspected. See general comment, below.

**Tx-2492. Stobi, CWE 48X75** **1970 ± 80**  
 $\delta^{13}C = -12.3\%$

Casa Romana, E (older) part of S wall (Wall 6). *Comment:* corrected date is 1915 ± 80.



1940 ± 80

 $\delta^{13}C = -12.7\%$ **Tx-2494. Stobi, CWE 50X75**

Casa Romana, W (younger) part of S wall (Wall 6). *Comment:* corrected date is 1865 ± 85.

*General Comment on Tx-1940, -2492, -2494:* age of Casa Romana not known from direct archaeol evidence. Tx-2492 and -2494 indicate 1st century AD, which is compatible with stratigraphic evidence and style of wall decoration. Structural evidence shows that Tx-2492 is earlier than -2494; dates suggest same relationship. Tx-1940, stratigraphically much later, nevertheless agrees with other 2 dates; very likely mortar of Tx-1940 originally came from Casa Romana and was redeposited. Field evidence suggested this possibility.

*General Comment on Stobi mortar dates (SV, Jr & EMD):* mortar dates support archaeol dates of times of construction, except in case of Theater where mortar dates vary.

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