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# RADIOCARBON AND OXIDIZABLE CARBON RATIO DATES FROM ARCHAEOLOGICAL SITES IN EAST TEXAS, PART II

*Timothy K. Perttula*

## ABSTRACT

This paper presents a second compilation of recently obtained radiocarbon and oxidizable carbon ratio dates obtained from archaeological sites in East Texas. An analysis of the age ranges in the more than 585 dates from East Texas archaeological sites indicate that most pertain to prehistoric and protohistoric Caddoan Indian occupations, particularly the Early (A.D. 1000-1200) and Middle Caddoan (A.D. 1200-1400) periods when prehistoric Caddoan settlements were widely distributed throughout the region.

## INTRODUCTION

More than 585 radiocarbon and oxidizable carbon ratio (OCR) dates have been obtained from archaeological sites in East Texas in the last 40 years or so (the OCR dates have only been obtained since 1996, however). This is a large and important chronological data base on prehistoric and historic Native American occupations in the region, but it has been a data base difficult to use because much of the information on the dates, and the archaeological sites from which the dates were obtained, has not been widely accessible until now. In this paper, I present a compendium of some 61 newly available radiocarbon and OCR dates from East Texas (Tables 1 and 2); previously, Perttula (1998a) published in *Radiocarbon* a compilation of 526 radiocarbon and OCR dates that was current through July 1, 1997.

This second compilation is based primarily on unpublished information from East Texas archaeological investigations, particularly cultural resource management excavations conducted under the auspices of the Antiquities Code of Texas and Section 106 of the National Historic Preservation Act. Perttula's (1998a) earlier work relied heavily on Dee Ann Story's (1990a) published compilation as the one key resource utilized to build the data base presented there, along with the extensive radiocarbon data base from investigations at Cooper Lake in the Sulphur River basin (see Fields et al. 1997: Appendix B). The results of the many additional samples included here were gathered from archaeological technical reports on file at the Division of Archeology at the Texas Historical Commission (Austin, Texas), or provided by researchers working in East Texas (see Acknowledgments).

Data on the newer radiocarbon assays are included in Table 1, namely the assay number, the provenience, the raw radiocarbon age, the delta 13C values, the corrected radiocarbon age, the calibrated age range, and the relative area under the probability distribution for one-sigma calibrated ages. The radiocarbon assays are uniformly corrected (for isotopic fractionation) and calibrated at a 20-year interval scale for calendric dates using CALIB 3.03c, Test 10 (Stuiver and Reimer 1993a, 1993b). Assays that lacked delta 13C values use the value estimates for fractionation correction suggested by Stuiver and Reimer (1993b:Table 1): -25 o/oo for nutshells and charcoal, and -10 o/oo for charred maize.

As of the writing of this paper, 16 archaeological sites in East Texas have OCR dates: 41BW553 (Largent et al. 1997), Underwood (41CP230), Knight's Bluff (41CS14), 41HO54, Hargrove Lake (41HO150), 41HO184 (Perttula and Prikryl 1997); 41HS407; Fasken (41RR14), Redwine (41SM193; Mark Walters, 1997 personal communication), 41TN110, 41TN113 (David H. Jurney, 1997 personal communication); 41TT653, 41TT670, Tom Moore (41PN149), Rookery Ridge (41UR133; see Parsons 1998); and the Camp Joy Mound (41UR144) (Perttula et al. 1997a, 1997b). OCR dating is a new dating procedure developed by the Archaeology Consulting Team, Inc. (Essex Junction, Vermont) for obtaining absolute dates on charcoal and soil humic materials from features. The procedure measures the relationship between the total carbon and the readily oxidizable carbon in a soil sample, with the ratio between the two--the oxidizable carbon ratio--apparently following a linear progression through time. Frink (1992, 1994, 1995; see also Kindall 1997) discusses the OCR dating procedure in detail. Table 2 provides data on the 48 available OCR dates in East Texas, with information on assay number, the provenience, the calculated OCR date in years before present, the confidence interval, and the final, rounded date as suggested by Frink (1996 personal communication). As OCR dating is a new dating method, its reliability and validity (in the sense of Ramenofsky and Steffen 1998:8-10) as an absolute estimate of time has not been fully established, and more OCR samples are warranted (particularly from a variety of contexts where radiocarbon dates have also been obtained) to assess how the influencing factors of sample depth, mean temperature, average annual rainfall, mean soil texture, soil acidity, and percent of carbon (Frink 1994) in the OCR procedure work for samples from East Texas (Douglas S. Frink, August 5, 1998 personal communication).

## DATA BASE

Currently, there are 538 available radiocarbon dates and 49 OCR dates from 118 prehistoric archaeological sites in 24 East Texas counties (Table 3). However, most of the archaeological sites only have between one and three dates (see Tables 1 and 2), with very few of the sites having more than a total of 15 radiocarbon and/or OCR assays. The latter sites include George C. Davis (41CE19, n=130; see Story 1990a, 1997, 1998; Story and Valastro 1977); Oak Hill Village (41RK214; n=34; Robert Rogers, 1998 personal communication; see also Cruse 1995); Spider Knoll (41DT11, n=23; see Fields et al. 1994a); Arnold (41HP102, n=18; Doehner and Larson 1978); Hurricane Hill (41HP106, n=18; see Perttula 1998); and Mockingbird (41TT550, n=17; see Perttula et al. 1998); three of the sites are in the Cooper Lake project area in Delta and Hopkins counties (Fields et al. 1997).

**Table 3. County Statistics on Sites with Dates and Number of Dates**

| County | No. of Sites with Radiocarbon Dates | No. of Radiocarbon Dates | No. of Sites with OCR Dates | No. of OCR Dates |
|---|---|---|---|---|
| Anderson | 3 | 5 | - | - |
| Bowie | 3 | 10 | 1 | 9 |
| Camp | 3 | 5 | 1 | 3 |
| Cass | 5 | 12 | 1 | 3 |
| Cherokee | 1 | 130 | - | - |
| Delta | 15 | 84 | - | - |
| Harrison | 3 | 6 | 1 | 1 |
| Henderson | 4 | 11 | - | - |
| Houston | - | - | 3 | 4 |
| Hopkins | 10 | 67 | - | - |

**Table 3. County Statistics on Sites with Dates and Number of Dates, cont.**

| County | No. of Sites with Radiocarbon Dates | No. of Radiocarbon Dates | No. of Sites with OCR Dates | No. of OCR Dates |
|---|---|---|---|---|
| Jasper | 1 | 3 | - | - |
| Lamar | 2 | 20 | - | - |
| Morris | 1 | 5 | - | - |
| Nacogdoches | 3 | 15 | - | - |
| Panola | - | - | 1 | 3 |
| Red River | 5 | 23 | 1 | 4 |
| Rusk | 5 | 43 | - | - |
| Sabine | 2 | 2 | - | - |
| Shelby | 3 | 6 | - | - |
| Smith | 2 | 2 | 1 | 1 |
| Titus | 14 | 50 | 2 | 12 |
| Trinity | - | - | 2 | 2 |
| Upshur | 8 | 17 | 2 | 7 |
| Wood | 9 | 22 | - | - |
| Totals | 102 | 538 | 16 | 49 |

The counties with the highest numbers of sites with radiocarbon dates (Delta, Titus, and Hopkins) all have been the scene of intensive cultural resource management-related archaeological investigations in the 1980s and 1990s. The same situation basically exists for the counties with the highest numbers of radiocarbon (and OCR) dates, with the exception of Cherokee County, where the 130 dates from the George C. Davis site were obtained principally from intensive investigations of mound and village areas in 1968-1970 (Story 1997, 1998).

The great majority of the East Texas radiocarbon dates have been obtained from Late Archaic, Woodland, and Formative-Late Caddoan period sites (Figure 1). Less than 1.3 percent of the dates are associated with either Paleoindian (ca. 10,000 B.C.-6000 B.C.) or Early/Middle Archaic (ca. 6000 B.C.-2000 B.C.) period occupations, and less than 0.5 percent may be associated with the post-A.D. 1680 Caddoan occupation of the region. The largest number of radiocarbon dates (n=153) fall in the Middle Caddoan period (ca. A.D. 1200-1400), followed by the Early Caddoan period (ca. A.D. 1000-1200) (n=101; see Figure 1).

More than 80 percent of the radiocarbon dates pertain to occupations at prehistoric and protohistoric Caddoan sites in East Texas (see Figure 1). Relative to the 200 year periods defined by Story (1990b:334) for the Caddoan tradition, radiocarbon dates associated with the Early and Middle Caddoan periods comprise 63.5 percent of the total radiocarbon date sample, followed by those falling in the Late Caddoan (A.D. 1400-1680) (19.3 percent) and Formative Caddoan (A.D. 800-1000) (16.8 percent) periods (Figure 2).

At a slightly finer scale, using calibrated ages and age mid-points of 1-sigma calibrated age ranges, the largest number of Caddoan radiocarbon dates fall within the A.D. 1201-1300

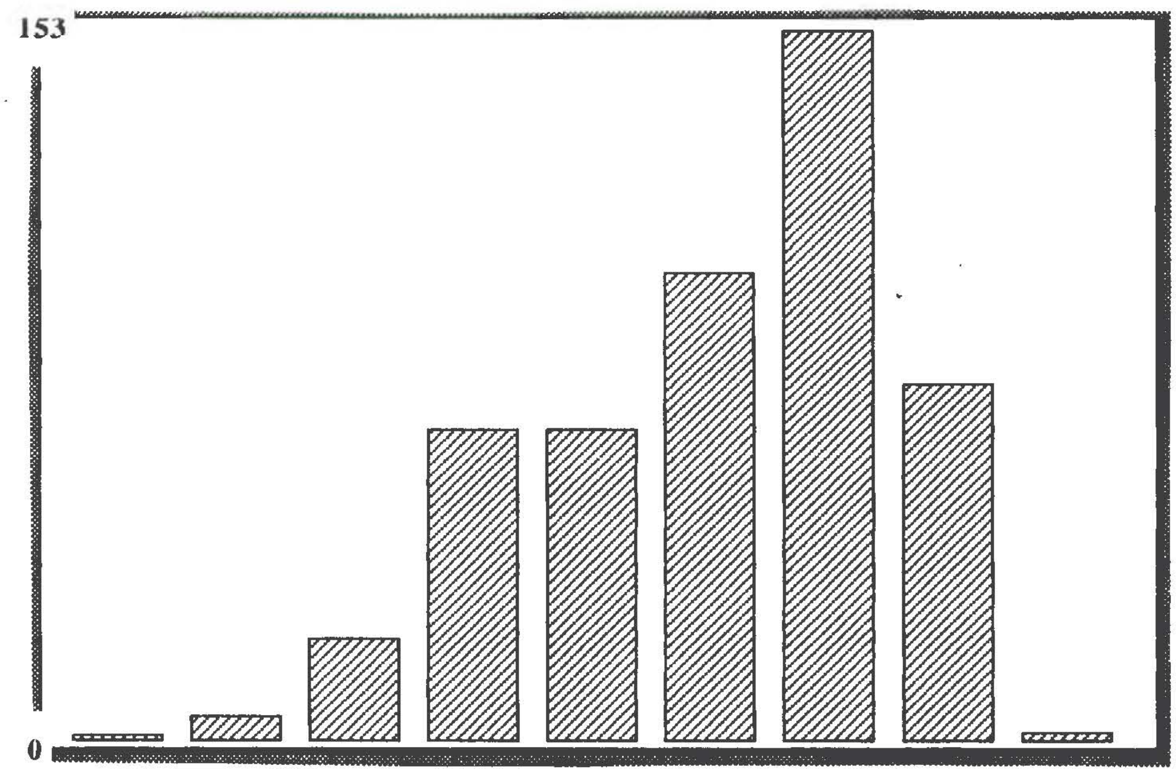


Figure 1. Number of Radiocarbon Dates for the Paleoindian, Early/Middle Archaic, Late Archaic, Woodland, Formative Caddoan, Early Caddoan, Middle Caddoan, Late Caddoan, and Historic Caddoan periods.

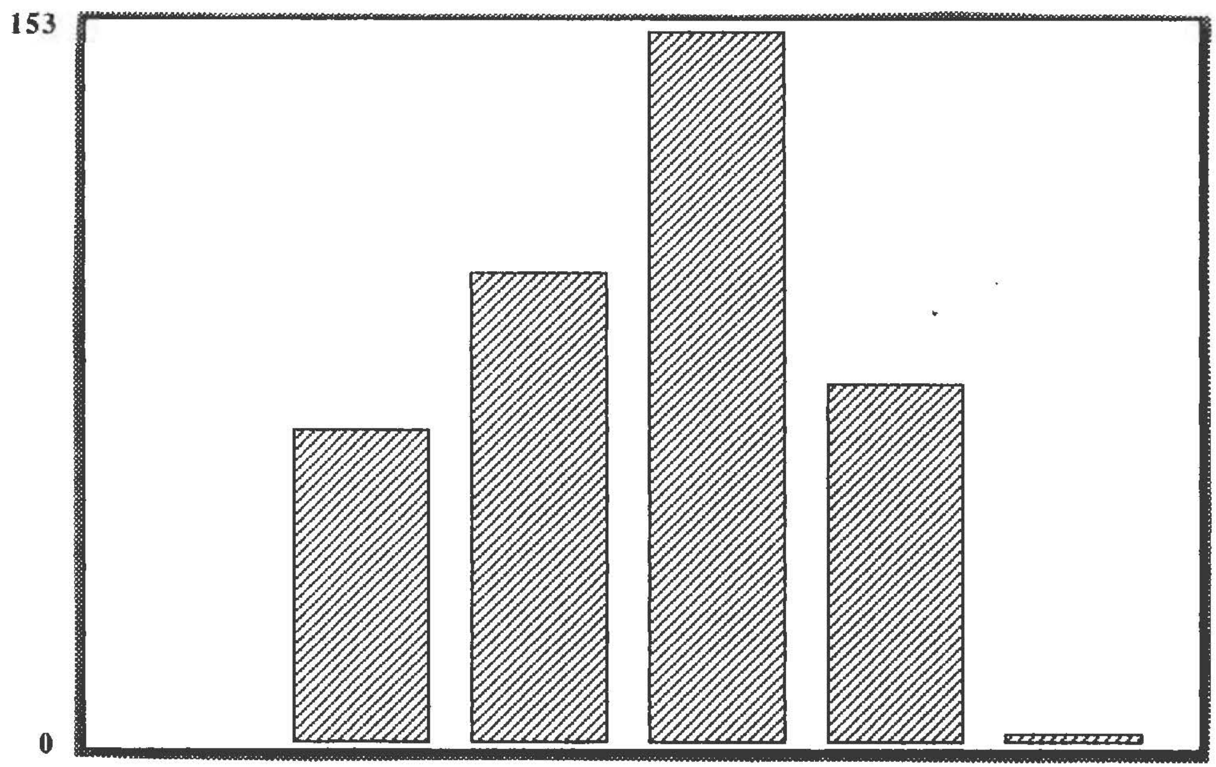


Figure 2. Number of Radiocarbon Dates for the Formative Caddoan through Historic Caddoan Periods.

interval (Figure 3). While the number of dates in this period of time is probably inflated to some degree by the extensive series of dates from the George C. Davis site (see Table 1), nevertheless it does appear to be the case that Middle Caddoan period occupations are rather commonplace throughout much of East Texas (see Middlebrook and Perttula 1997). In fact, this period probably represents the major peak in the occupational history of the region. As such, the available radiocarbon data support as a whole the broad findings of archaeological research from East Texas (see Story 1990b; Middlebrook and Perttula 1997). Other 100 year intervals with large numbers of radiocarbon dates are (in decreasing frequency) A.D. 1001-1100, A.D. 1301-1400, A.D. 1401-1500, and A.D. 901-1000. Radiocarbon dates are particularly rare for the A.D. 1601-1700 and A.D. 1701-1800 intervals.

Again using calibrated ages and mid-points of 1-sigma age ranges, but looking at 25 year intervals, there are interesting fluctuations in the number of radiocarbon dates for the Caddoan period sites in East Texas (Figure 4). The 25 year intervals between A.D. 1201-1225 and A.D. 1351-1375--the early and late parts of the Middle Caddoan period--have the most radiocarbon dates, followed by the intervals between A.D. 1226-1250 and A.D. 1326-1350.

## DISCUSSION

The single possible radiocarbon date from a Paleoindian context in East Texas is from charcoal in a possible hearth buried in Late Pleistocene alluvium at the Delta Bone Quarry 5 (41DT86) on the North Sulphur River (see Slaughter and Hoover 1963, 1965). While the context of the materials (including an antler tool) from the site are not unequivocal, the calibrated 1 sigma date of 8082-9170 B.C. is broadly contemporaneous with Clovis, Folsom, and Dalton complexes in the region.

Two sites in East Texas, both in the Sulphur River basin, have archaeological components dated by radiocarbon to pre-3000 B.C. contexts. A single burned rock feature at the Unionville site (41CS151) has a calibrated date of 4040-4161 B.C. (see Cliff et al. 1996), while extensive excavations at the Finley Fan site (41HP159) exposed portions of two buried and stratigraphically discrete Middle Archaic components that date between 3152-4410 B.C. (see Fields et al. 1997:42).

For the Late Archaic period, there are still few well-dated archaeological components, although occupations of this period are apparently abundant throughout all East Texas river valleys and hinterland areas (cf. Fields 1995; Perttula 1995). Fairly well-dated Late Archaic components include buried shell lens that date from 766-1084 B.C. at the Winston site (41HE245) on the Trinity River (see Richner and Bagot 1978); a buried scatter of burned rocks and lithic artifacts at the W. S. Long #3 site (41HP118) in the South Sulphur River floodplain that dates from 924-1222 B.C. (see McGregor and Martin 1997); and a small concentration of tools and burned rocks at the Mockingbird site (41TT550) that date between 408-828 B.C. (see Table 1).

The best-dated Woodland period components in East Texas were investigated prior to the construction of Cooper Lake on the South Sulphur River (Fields et al. 1997). These include the Tick (41DT6), Spike (41DT16), Hurricane Hill (41HP106), and 41HP137 sites. The Tick and Spike sites have thick (60-100 cm) middens, with calibrated age spans for the Woodland occupations of A.D. 192-896 and B.C. 195-A.D. 891, respectively (see Table 1). The six calibrated dates from Woodland period contexts at Hurricane Hill range from A.D. 59-449, and they are from features associated with a small midden and a

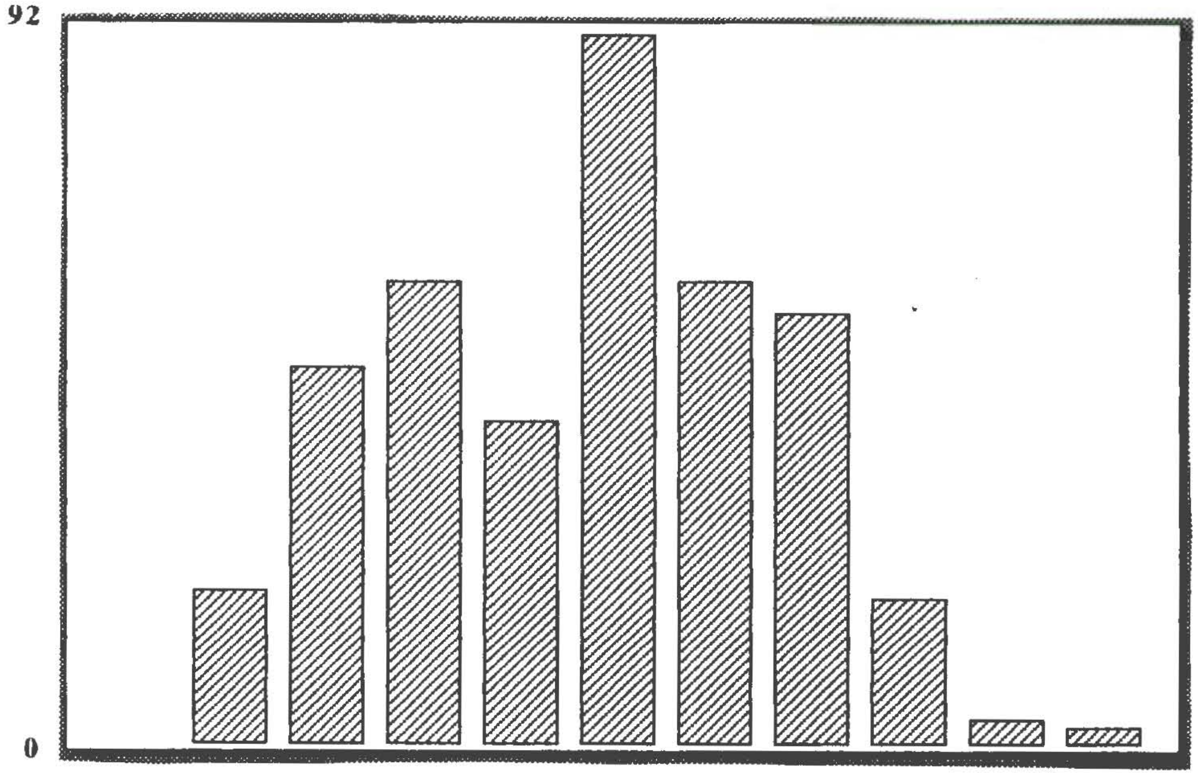


Figure 3. Number of Calibrated Radiocarbon Dates at 100 Year Intervals, A.D. 800-1750.

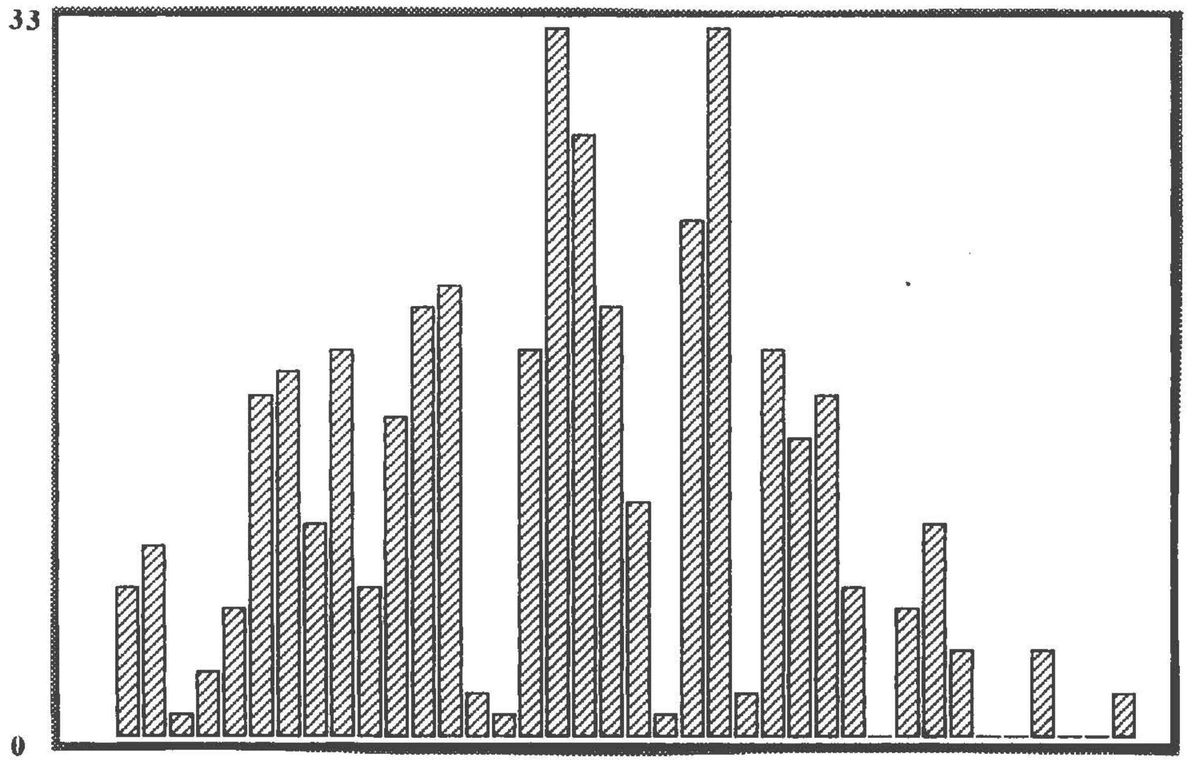


Figure 4. Number of Calibrated Radiocarbon Dates at 25 Year Intervals, A.D. 800-1675.

cemetery of cremations and bundle burials (Perttula 1998). At 41HP137, the Woodland component dates from B.C. 122-A.D. 652, the radiocarbon dates being obtained from small pit features, one of which contained charred cultivated squash seeds (see McGregor 1997).

Certainly the most thoroughly dated Formative and Early Caddoan period site in East Texas is the George C. Davis site (41CE19), a large village and mound center on the Neches River (Story 1997). Calibrated radiocarbon dates from village contexts establish that the site was occupied beginning in the ninth century A.D., and then continuously settled through the end of the 13th century A.D. A late series of calibrated dates from a few village contexts (such as Units 11, 43, and 109; see Story 1998:Table 2-1) suggest that the site was inhabited to some degree as late as ca. A.D. 1350 (see Table 1). While there are fewer dates from the three mounds at George C. Davis, and there are inconsistencies between several of the dates from the same general contexts, it does appear to be the case that Mound A (a large flat-topped platform) and Mound C (a burial mound) were built in the latter part of the Formative Caddoan period (see Story 1997, 1998), and Mound B (flat-topped platform) was constructed about A.D. 1200 or slightly earlier.

There are several well-dated Early Caddoan period habitation sites at Cooper Lake, including the upper component at Spike, Doctors Creek (41DT124; see Martin 1997), and 41DT63 (Fields et al. 1997). In the upper Sabine River basin, Early Caddoan habitation sites with consistent radiocarbon dates have been investigated at Taddlock (41WD482) and Spoonbill (41WD109) (see Bruseth and Perttula 1981), as well as the Hudnall-Pirtle (41RK4) mound center and village in the middle stretches of the Sabine River basin (see Bruseth 1991). Two calibrated dates from one of the eight mounds at Hudnall-Pirtle range between A.D. 1152-1250. In the Red River, dated Early Caddoan period components are best known from the Roitsch or Sam Kaufman (41RR16) and Ray (41LR135) sites, both investigated during the 1991-1992 Texas Archeological Society field schools under the direction of Dr. James E. Bruseth. At Roitsch-Sam Kaufman, four calibrated dates from a structure near the East Mound (see Skinner et al. 1969) range between A.D. 982-1250 (see Table 1).

Two of the archaeological sites at Cooper Lake have fairly well-dated components that document settlements that extend from the Early Caddoan period into the Middle Caddoan period, Spider Knoll (41DT11) and Arnold (41HP102). At Spider Knoll, the many dates (see Table 1) suggest the site was used a number of times over a period of ca. 400 years (Fields et al. 1997:61), with the majority of the calibrated dates ranging from A.D. 880-1287 (see Table 1). With a few exceptions, the radiocarbon dates from the Arnold site fall into this same calibrated age range.

There are several Middle Caddoan period components in East Texas that appear to be well-dated by radiocarbon and/or OCR assays. At site 41TT670 (Largent et al. 1997) on White Oak Creek, one calibrated radiocarbon date and an OCR date (see Table 2) suggest the Middle Caddoan component dates about A.D. 1150-1280, while two radiocarbon dates from Knight's Bluff (41CS14) pertain to a late Middle Caddoan phase that dates from ca. A.D. 1300-1400 (Cliff 1997: Table 1); the OCR dates from the midden. OCR and radiocarbon dates from mound contexts at the Fasken site (41RR14) suggest that Mound B was initially constructed in the 11th century and Mound C in the 12th or early 13th century, during the Sanders phase occupation of this multiple mound center.

A residential Middle Caddoan period component at the Hurricane Hill site (41HP106) in the Cooper Lake area dates from a number of calibrated radiocarbon assays from features on the South rise to between A.D. 1248-1394 (see Perttula 1998b; Fields et al. 1997). An archeomagnetic date of A.D. 1300 $\pm$ 50 has also been obtained from this Middle Caddoan component.

In the middle and upper Sabine River basin, the best dated Middle Caddoan components include McKenzie (41WD55), a substructural mound site (Granberry 1995), the Oak Hill Village (41RK214), and Spoonbill (41WD109) (see Table 1). The calibrated dates from the McKenzie mound range between A.D. 1298-1470, while the three from Middle Caddoan features at the Spoonbill site are slightly earlier (A.D. 1228-1393). The many available radiocarbon dates from the Oak Hill Village suggest the occupation there dates between ca. A.D. 1150-1400, but additional radiocarbon dates on other structures and features, along with the ceramic analyses of the decorated sherds, may well refine the estimates of the site's temporal range (Robert Rogers, 1998 personal communication).

The Washington Square site (41NA49) in the Neches-Angelina river basin is another well-dated mound complex (Corbin and Hart 1998). Pooled radiocarbon dates on charcoal, hardwood nutshells, and charred corn range between cal AD 1268-1302 (Corbin and Hart 1998:74 and Table 4). Finally, four calibrated radiocarbon assays from the Tyson site (41SY92) date this important Middle Caddoan period settlement in the Attoyac River basin (Middlebrook 1994) to between A.D. 1336-1490 (see Table 1). One of the dates was on mussel shells included as grave goods with Feature 14, the burial of a 3 to 4 year old child accompanied by many grave goods (Middlebrook 1994:16).

None of the Late Caddoan archaeological phases in East Texas (see Story 1990b:Table 43) are particularly well-dated by either radiocarbon or OCR methods. This is particularly the case for the Frankston and Allen phases, although several late 17th-early 18th century archeomagnetic dates have been obtained from the Allen phase component at the Deshazo site (Story 1995), and two radiocarbon dates from a midden deposit at the Alcoa No. 1 site (41AN87) date the Frankston phase occupation between A.D. 1386-1488 (Amick et al. 1991).

The Titus and McCurtain phases have become better dated by absolute means over the last few years (cf. Perttula et al. 1997a, 1998; Bruseth 1998). For the Titus phase, radiocarbon and OCR dates from sites such as Tuck Carpenter (41CP5), Sam Roberts (41CP8), Underwood (41CP230), 41TT182, Mockingbird (41TT550), 41TT653, 41UR118 and Rookery Ridge (41UR133) at proposed Lake Gilmer, the Camp Joy Mound (41UR144) at Lake O' the Pines, and Steck (41WD529) suggest that the Titus phase dates between ca. A.D. 1430-1680 (Perttula 1998c). Significantly, four comparable OCR and radiocarbon dates from the same context--a burned house lens--at the Camp Joy Mound (see Tables 1 and 2) have convincingly documented the use of the platform mound at the site between about A.D. 1500-1650.

Radiocarbon dates from McCurtain phase contexts at the Roitsch-Sam Kaufman, Holdeman (41RR11; see Perino 1995), and Rowland Clark (41RR77; Perino 1994) sites indicate that the McCurtain phase can be divided into early (ca. A.D. 1300/1350-1500) and late (ca. A.D. 1500-1700) contexts (cf. Bruseth 1998), with corresponding changes in ceramic decorative styles and the shape of arrow points. The early McCurtain phase features at the Holdeman site date to A.D. 1392-1478 at 1-sigma and A.D. 1332-1513 at Roitsch-Sam Kaufman (see Table 1), while calibrated dates from ceramically-later features at the Rowland Clark site range from A.D. 1502-1603. Interestingly, calibrated radiocarbon dates from the Peerless Bottoms site (41HP175) in the upper Sulphur River basin, having virtually the same variety of Caddoan ceramics as early McCurtain phase sites on the Red River, range between A.D. 1330-1524 (see Fields et al. 1994b).

## SUMMARY

Given the possibility of sampling biases based on the selective collection of samples from the better preserved sedentary Caddoan occupation of the region, the highly concentrated nature of cultural resource management excavation projects in East Texas (see the discussion in Bruseth [1998:49]), and calibration curve effects (e.g., Miller 1996:55-69) on such a series of calibrated radiocarbon dates, there are clear peaks and valleys in the number of radiocarbon dates from prehistoric archaeological sites in East Texas (see Figures 1 and 2). Most notably, the analysis of the age ranges in the calibrated dates indicate that most pertain to prehistoric and protohistoric Caddoan Indian occupations, particularly the Early (A.D. 1000-1200) through Middle Caddoan (A.D. 1200-1400) periods when prehistoric Caddoan settlements were widely distributed throughout the region. Surely, future analyses of age trends based on a much larger and spatially expansive radiocarbon and OCR data base will help to clarify and enrich these findings.

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**Table 1. Additional Radiocarbon Dates from East Texas**

| Assay No. | Provenience | Raw Age | Delta $^{13}C$ | Corrected $^{14}C$ Age | Calibrated Age Range | Relative Area under probability distribution |
|---|---|---|---|---|---|---|
| | | | **Underwood (41CP230)** | | | |
| B-120069 | Unit 8, 25-35 cm | 460 ± 70 | -28.3 o/oo | 410 ± 70 | AD 1436-1519 | 0.66 |
| | | | | | AD 1574-1625 | 0.34 |
| B-120070 | Unit 10/20, 25-35 cm | 320 ± 50 | -27.5 o/oo | 280 ± 50 | AD 1516-1589 | 0.52 |
| | | | | | AD 1622-1669 | 0.43 |
| | | | | | AD 1787-1792 | 0.03 |
| | | | **Hurricane Hill (41HP106)** | | | |
| B-108169** | U. 259, lv. 7A, maize | 530 ± 30 | -10.7 o/oo | 770 ± 30 | AD 1249-1285 | 1.00 |
| B-108170 | Fea. 82 | 260 ± 50 | -25.4 o/oo | 260 ± 50 | AD 1522-1566 | 0.26 |
| | | | | | AD 1628-1677 | 0.47 |
| | | | | | AD 1773-1800 | 0.18 |
| | | | | | AD 1941-1955* | 0.09 |
| | | | **Oak Hill Village (41RK214)** | | | |
| B-71486** | Str. 39, PH 3 | 820 ± 60 | -26.2 o/oo | 800 ± 60 | AD 1198-1286 | 1.00 |
| B-96908** | Str. 5, PH 46 | 620 ± 50 | -22.3 o/oo | 660 ± 50 | AD 1345-1391 | 0.65 |
| | | | | | AD 1292-1317 | 0.35 |

| Assay No. | Provenience | Raw Age | Delta $^{13}C$ | Corrected $^{14}C$ Age | Calibrated Age Range | Relative Area under probability distribution |
|---|---|---|---|---|---|---|
| B-96909** | Str. 12?, PH 1 | 740 ± 50 | -27.0 o/oo | 700 ± 50 | AD 1276-1311<br>AD 1351-1387 | 0.58<br>0.42 |
| B-96910** | Str. 2, PH 145 | 720 ± 60 | -24.5 o/oo | 720 ± 60 | AD 1247-1309<br>AD 1356-1383 | 0.76<br>0.24 |
| B-96911** | Str. 12, PH 3 | 700 ± 50 | -24.1 o/oo | 720 ± 50 | AD 1253-1307<br>AD 1361-1378 | 0.85<br>0.15 |
| B-96912** | Str. 5, PH 45 | 670 ± 50 | -24.9 o/oo | 670 ± 50 | AD 1347-1390<br>AD 1288-1315 | 0.61<br>0.39 |
| B-96913** | Str. 12, PH 15 | 850 ± 60 | -24.5 o/oo | 850 ± 60 | AD 1159-1275<br>AD 1065-1074<br>AD 1127-1133 | 0.93<br>0.04<br>0.03 |
| B-96914** | Str. 5, PH 19 | 710 ± 60 | -23.6 o/oo | 730 ± 60 | AD 1232-1306<br>AD 1363-1376 | 0.90<br>0.10 |
| B-96915** | Str. 2, PH 72 | 590 ± 50 | -22.5 o/oo | 630 ± 50 | AD 1304-1324<br>AD 1337-1370<br>AD 1370-1394 | 0.27<br>0.43<br>0.31 |
| B-96916** | Str. 5, PH 17 | 660 ± 50 | -24.7 o/oo | 660 ± 50 | AD 1345-1391<br>AD 1292-1317 | 0.65<br>0.35 |
| B-96917** | Str. 12, PH 38 | 180 ± 50 | -25.2 o/oo | 180 ± 50 | AD 1663-1694<br>AD 1726-1816<br>AD 1922-1955* | 0.19<br>0.60<br>0.21 |

| Assay No. | Provenience | Raw Age | Delta $^{13}C$ | Corrected $^{14}C$ Age | Calibrated Age Range | Relative Area under probability distribution |
|---|---|---|---|---|---|---|
| B-96918** | Str. 5,<br>PH 43 | 630 ± 50 | -17.1 o/oo | 750 ± 50 | AD 1239-1296 | 1.00 |
| B-96919** | Str. 5,<br>PH 18 | 730 ± 50 | -22.3 o/oo | 730 ± 50 | AD 1243-1305<br>AD 1368-1372 | 0.96<br>0.04 |
| B-96920** | Str. 2,<br>PH 115 | 680 ± 60 | -20.9 o/oo | 740 ± 60 | .AD 1226-1304<br>AD 1369-1371 | 0.98<br>0.02 |
| B-96921** | Str. 2,<br>PH 50 | 570 ± 50 | -22.9 o/oo | 610 ± 50 | AD 1307-1360<br>AD 1379-1400 | 0.71<br>0.29 |
| B-107399** | Str. 19,<br>Fea. 274 | 520 ± 50 | -26.2 o/oo | 500 ± 50 | AD 1403-1448 | 1.00 |
| B-107400** | Str. 10,<br>Fea. 163 | 480 ± 50 | -28.5 o/oo | 420 ± 50 | AD 1435-1512<br>AD 1597-1618 | 0.84<br>0.16 |
| B-107401** | Str. 21,<br>Fea. 272 | 1180 ± 70 | -30.8 o/oo | 1080 ± 70 | AD 893-1017 | 1.00 |
| B-107402** | Str. 35,<br>Fea. 265 | 1130 ± 50 | -18.4 o/oo | 1240 ± 50 | AD 763-875<br>AD 717-741 | 0.83<br>0.17 |
| B-110061** | Str. 38,<br>Fea. 243,<br>maize | 440 ± 40 | -13.2 o/oo | 640 ± 40 | AD 1343-1392<br>AD 1301-1319 | 0.74<br>0.26 |

| Assay No. | Provenience | Raw Age | Delta $^{13}C$ | Corrected $^{14}C$ Age | Calibrated Age Range | Relative Area under probability distribution |
|---|---|---|---|---|---|---|
| B-110062** | Str. 10, Fea. 180 | 630 ± 40 | -23.6 o/oo | 650 ± 40 | AD 1345-1391<br>AD 1297-1317 | 0.71<br>0.29 |
| B-110063** | Fea. 219 | 870 ± 40 | -23.1 o/oo | 900 ± 40 | AD 1049-1090<br>AD 1118-1141<br>AD 1155-1209 | 0.35<br>0.19<br>0.46 |
| B-110064** | Fea. 194, maize | 330 ± 40 | -10.3 o/oo | 570 ± 40 | AD 1390-1421<br>AD 1315-1347 | 0.53<br>0.47 |
| B-110065** | Fea. 105, maize | 390 ± 40 | -9.9 o/oo | 630 ± 40 | AD 1305-1322<br>AD 1339-1368<br>AD 1372-1393 | 0.26<br>0.42<br>0.32 |
| B-110066** | Str. 21, Fea. 173, maize | 330 ± 40 | -9.7 o/oo | 570 ± 40 | AD 1390-1421<br>AD 1315-1347 | 0.53<br>0.47 |
| B-110067** | Str. 19, Fea. 178, maize | 210 ± 40 | -9.5 o/oo | 570 ± 40 | AD 1390-1421<br>AD 1315-1347 | 0.53<br>0.47 |
| B-110068** | Str. 39, Fea. 261 | 590 ± 40 | -26.7 o/oo | 570 ± 40 | AD 1390-1421<br>AD 1315-1347 | 0.53<br>0.47 |

| Assay No. | Provenience | Raw Age | Delta $^{13}C$ | Corrected $^{14}C$ Age | Calibrated Age Range | Relative Area under probability distribution |
|---|---|---|---|---|---|---|
| | | | **41RK342** | | | |
| B-96319** | Fea. 1 | 610 ± 40 | -26.6 o/oo | 590 ± 50 | AD 1309-1357 | 0.64 |
| | | | | | AD 1382-1409 | 0.36 |
| | | | **Bryan Hardy (41SM55)** | | | |
| Tx-9276 | House post | 680 ± 40 | -26.8 o/oo | 650 ± 40 | AD 1345-1391 | 0.71 |
| | | | | | AD 1297-1317 | 0.29 |
| | | | **41TT653** | | | |
| B-105530** | Fea. 3 | 380 ± 50 | -23.8 o/oo | 400 ± 50 | AD 1442-1519 | 0.63 |
| | | | | | AD 1574-1625 | 0.37 |
| B-105531** | Fea. 3 | 360 ± 50 | -21.8 o/oo | 410 ± 50 | AD 1436-1518 | 0.69 |
| | | | | | AD 1580-1624 | 0.31 |

* Calibrated dates ending in 1955* denote the influence of atomic bomb C-14

** Accelerator Mass Spectrometer assays

•• Two-sigma calibrated ages

Note: Radiocarbon assays with Delta $^{13}C$ are corrected (for isotopic fractionation) and calibrated at a 20-year interval scale for calendric dates using CALIB 3.03c, Test 10 (Stuiver and Reimer 1993a, 1993b).

**Table 2. New Oxidizable Carbon Ratio Dates from East Texas Sites**

| Assay No. | Provenience | Calculated OCR Date* | Confidence Interval | Rounded Date |
|---|---|---|---|---|
| | | **Underwood (41CP230)** | | |
| ACT 3215 | Midden, TU 3, 16-18 cm | 458 | ± 13 | AD 1475-1505 |
| ACT 3216 | Base of Midden profile | 550 | ± 16 | AD 1385-1415 |
| ACT 3217 | Middle Depths of Midden profile | 476 | ± 14 | AD 1455-1490 |
| | | **41HO54** | | |
| ACT 2740 | SS1, 15-17 cm | 3323 | + | 1370 B.C. |
| | | **Hargrove Lake (41HO150)** | | |
| ACT 2743 | SS1, 8-10 cm | 888 | + | AD 1060 |
| | | **41HO184** | | |
| ACT 2899 | BHT 3, 26 cm | 1148 | + | AD 800 |
| ACT 2900 | BHT 3, 44 cm | 1585 | + | AD 360 |

| Assay No. | Provenience | Calculated OCR Date* | Confidence Interval | Rounded Date |
|---|---|---|---|---|
| | | **41HS407** | | |
| ACT 3218 | Associated with Fea. 1, ST D-38, 24-28 cm | 602 | ± 18 | AD 1330-1370 |
| | | **Tom Moore (41PN149)** | | |
| ACT 2826 | Base of midden, 40 cm | 1655 | ± 49 | AD 250-340 |
| | | **Fasken (41RR14)** | | |
| ACT 3261 | Mound C, N690 E451, 42 cm bs | 682 | ± 20 | AD 1250-1290 |
| ACT 3262 | Mound B, Trench 2, N512E500, Fea. 3 clay floor | 808 | ± 24 | AD 1116-1164 |
| ACT 3263 | Mound B, Trench 2, N512E500, Zone 6, 163-168 cm bs, buried A-horizon below mound | 1011 | ± 30 | AD 910-970 |
| ACT 3303 | Mound B, Trench 2, Zone 5, 110-117 cm bs, first mound fill | 1175 | ± 35 | AD 740-810 |

| Assay No. | Provenience | Calculated OCR Date* | Confidence Interval | Rounded Date |
|---|---|---|---|---|
| | | **Redwine (41SM193)** | | |
| ACT 2827 | Fea. 4, 30-40 cm | 1398 | ±41 | AD 510-590 |
| | | **41TN110** | | |
| ACT 2747 | SS1, 15-17 cm | 1753 | + | AD 200 |
| | | **41TN113** | | |
| ACT 2751 | STP 3, 15-17 cm | 1460 | + | AD 490 |
| | | **41TT653** | | |
| ACT 3264 | Fea. 33, 60-65 cm, Str. 1 hearth | 372 | ± 11 | AD 1570-1590 |
| ACT 3265 | Fea. 1, 30-40 cm | 140 | ± 5 | AD 1805-1815 |
| ACT 3266 | Fea. 1, 50-60 cm | 357 | ± 10 | AD 1580-1600 |
| ACT 3267 | Fea. 34, 30-40 cm, Str. 3 midden | 230 | ± 6 | AD 1710-1730 |
| ACT 3268 | Fea. 34, 15-30 cm, Str. 3 midden | 330 | ± 9 | AD 1610-1630 |

| Assay No. | Provenience | Calculated OCR Date* | Confidence Interval | Rounded Date |
| --- | --- | --- | --- | --- |
| | | **Rookery Ridge (41UR133)** | | |
| ACT 3219 | Saddle Area Profile, 32 cm, associated with clay hearth | 757 | ± 22 | AD 1170-1210 |
| ACT 3220 | N183E402, Zone A, top of midden | 319 | ± 9 | AD 1620-1640 |
| ACT 3221 | N183E402, Zone B, ash lens | 291 | ± 8 | AD 1650-1670 |
| ACT 3222 | N186E391, midden, 39 cm | 547 | ± 16 | AD 1385-1415 |
| ACT 3223 | N186E391, midden, 58 cm | 766 | ± 22 | AD 1160-1200 |

* Before Present (A.D. 1950)

+ No confidence interval provided, because samples are an expression of the Mean Residence Time (mean residence time of all the organic carbon (Douglas S. Frink, 1997 personal communication)