



October 27, 2021

Dr. Mary Beth Trubitt
Henderson State University
Arkansas Archaeological Survey
P.O. Box H-7841
Arkadelphia, AR 71999
United States

RE: Radiocarbon Dating Results

Dear Dr. Trubitt,

Enclosed are the radiocarbon dating results for two samples recently sent to us. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable. The Conventional Radiocarbon Ages have all been corrected for total fractionation effects and where applicable, calibration was performed using 2020 calibration databases (cited on the graph pages).

The web directory containing the table of results and PDF download also contains pictures, a cvs spreadsheet download option and a quality assurance report containing expected vs. measured values for 3-5 working standards analyzed simultaneously with your samples.

Reported results are accredited to ISO/IEC 17025:2017 Testing Accreditation PJLA #59423 standards and all chemistry was performed here in our laboratory and counted in our own accelerators here. Since Beta is not a teaching laboratory, only graduates trained to strict protocols of the ISO/IEC 17025:2017 Testing Accreditation PJLA #59423 program participated in the analyses.

As always Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference. When counting statistics produce sigmas lower than +/- 30 years, a conservative +/- 30 BP is cited for the result unless otherwise requested. The reported d13C values were measured separately in an IRMS (isotope ratio mass spectrometer). They are NOT the AMS d13C which would include fractionation effects from natural, chemistry and AMS induced sources.

When interpreting the results, please consider any communications you may have had with us regarding the samples.

Thank you for prepaying the analyses. As always, if you have any questions or would like to discuss the results, don't hesitate to contact us.

Sincerely,



Digital signature on file

Chris Patrick
Vice President of Laboratory Operations



ISO/IEC 17025:2017-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Mary Beth Trubitt

Report Date: October 27, 2021

Henderson State University

Material Received: October 15, 2021

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes	
-------------------	--------------------	---	--

Beta - 606048

1976-663-3

550 +/- 30 BP

IRMS $\delta^{13}C$: -25.9 o/oo

(58.0%)

1388 - 1434 cal AD

(562 - 516 cal BP)

(37.4%)

1318 - 1360 cal AD

(632 - 590 cal BP)

Submitter Material: Charcoal

Pretreatment: (charred material) acid/alkali/acid

Analyzed Material: Charred material

Analysis Service: AMS-Standard delivery

Percent Modern Carbon: 93.38 +/- 0.35 pMC

Fraction Modern Carbon: 0.9338 +/- 0.0035

D14C: -66.18 +/- 3.49 o/oo

$\Delta^{14}C$: -74.16 +/- 3.49 o/oo (1950:2021)

Measured Radiocarbon Age: (without d13C correction): 560 +/- 30 BP

Calibration: BetaCal4.20: HPD method: INTCAL20

Results are ISO/IEC-17025:2017 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the ¹⁴C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB. References for calendar calibrations are cited at the bottom of calibration graph pages.



ISO/IEC 17025:2017-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Mary Beth Trubitt

Report Date: October 27, 2021

Henderson State University

Material Received: October 15, 2021

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes	
-------------------	--------------------	--	--

Beta - 606049

1976-663-4

630 +/- 30 BP

IRMS $\delta^{13}C$: -26.2 o/oo

(95.4%)

1292 - 1398 cal AD

(658 - 552 cal BP)

Submitter Material: Charcoal

Pretreatment: (charred material) acid/alkali/acid

Analyzed Material: Charred material

Analysis Service: AMS-Standard delivery

Percent Modern Carbon: 92.46 +/- 0.35 pMC

Fraction Modern Carbon: 0.9246 +/- 0.0035

D14C: -75.43 +/- 3.45 o/oo

$\Delta^{14}C$: -83.34 +/- 3.45 o/oo (1950:2021)

Measured Radiocarbon Age: (without $\delta^{13}C$ correction): 650 +/- 30 BP

Calibration: BetaCal4.20: HPD method: INTCAL20

Results are ISO/IEC-17025:2017 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the ^{14}C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. $\delta^{13}C$ values are on the material itself (not the AMS $\delta^{13}C$). $\delta^{13}C$ and $\delta^{15}N$ values are relative to VPDB. References for calendar calibrations are cited at the bottom of calibration graph pages.

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL20)

(Variables: $\delta^{13}\text{C} = -25.9$ o/oo)

Laboratory number **Beta-606048**

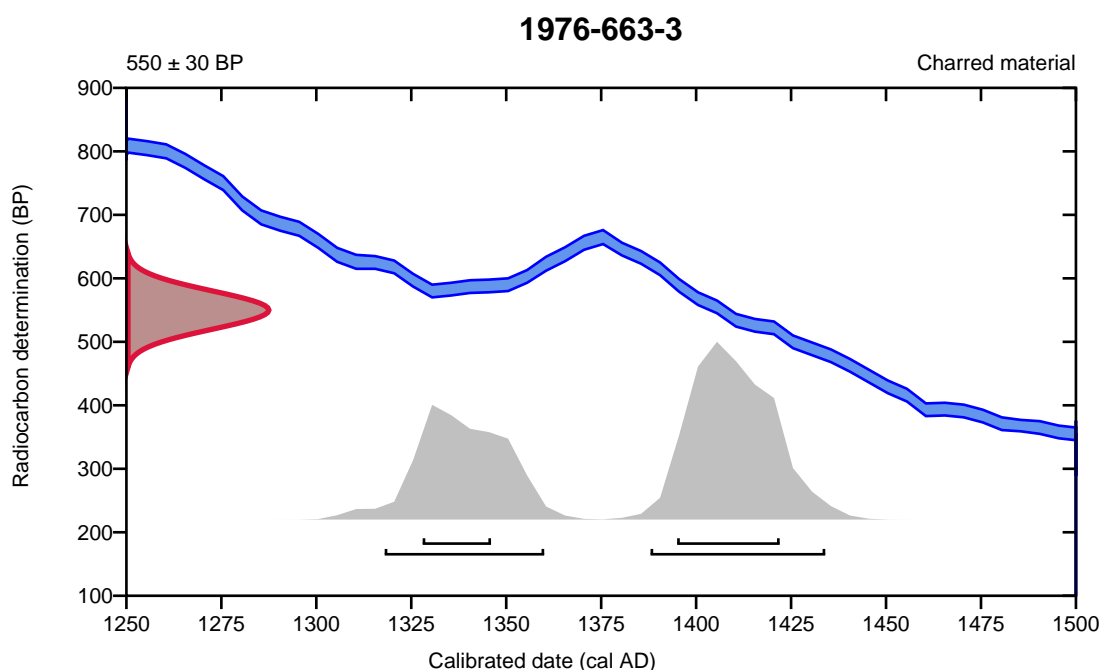
Conventional radiocarbon age **550 ± 30 BP**

95.4% probability

(58%)	1388 - 1434 cal AD	(562 - 516 cal BP)
(37.4%)	1318 - 1360 cal AD	(632 - 590 cal BP)

68.2% probability

(46.8%)	1395 - 1422 cal AD	(555 - 528 cal BP)
(21.4%)	1328 - 1346 cal AD	(622 - 604 cal BP)



Database used
INTCAL20

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. *Radiocarbon*, 51(1), 337-360.

References to Database INTCAL20

Reimer, et al., 2020, *Radiocarbon* 62(4):725-757.

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL20)

(Variables: $\delta^{13}C = -26.2$ o/oo)

Laboratory number **Beta-606049**

Conventional radiocarbon age **630 ± 30 BP**

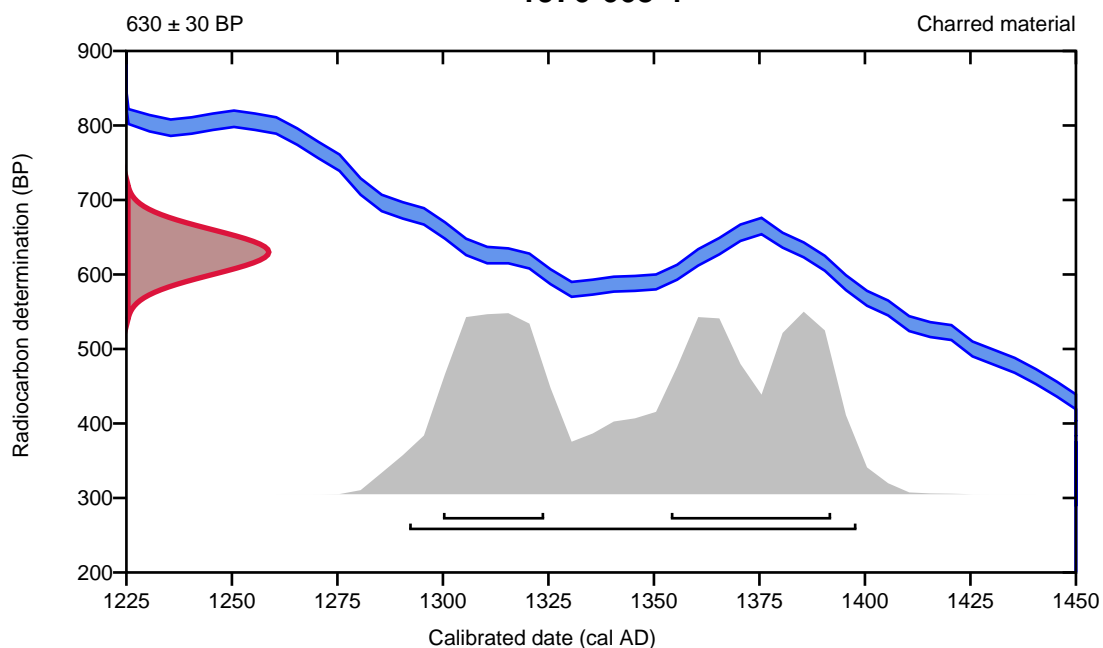
95.4% probability

(95.4%) 1292 - 1398 cal AD (658 - 552 cal BP)

68.2% probability

(39%) 1354 - 1392 cal AD (596 - 558 cal BP)
(29.2%) 1300 - 1324 cal AD (650 - 626 cal BP)

1976-663-4



Database used
INTCAL20

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. *Radiocarbon*, 51(1), 337-360.

References to Database INTCAL20

Reimer, et al., 2020, *Radiocarbon* 62(4):725-757.



Quality Assurance Report

This report provides the results of reference materials used to validate radiocarbon analyses prior to reporting. Known-value reference materials were analyzed quasi-simultaneously with the unknowns. Results are reported as expected values vs measured values. Reported values are calculated relative to NISTSRM-1990C and corrected for isotopic fractionation. Results are reported using the direct analytical measure percent modern carbon (pMC) with one relative standard deviation. Agreement between expected and measured values is taken as being within 2 sigma agreement (error x 2) to account for total laboratory error.

Report Date: October 27, 2021
Submitter: Dr. Mary Beth Trubitt

QA MEASUREMENTS

Reference 1

Expected Value: 0.42 +/- 0.04 pMC
Measured Value: 0.42 +/- 0.03 pMC
Agreement: Accepted

Reference 2

Expected Value: 96.69 +/- 0.50 pMC
Measured Value: 95.70 +/- 0.29 pMC
Agreement: Accepted

Reference 3

Expected Value: 129.41 +/- 0.06 pMC
Measured Value: 129.70 +/- 0.37 pMC
Agreement: Accepted

COMMENT: All measurements passed acceptance tests.

Validation:


Digital signature on file

Date: October 27, 2021