November 30, 2017

Mr. Alex Cebulski and Dr. Joe Desloges
22 Russel street
Toronto, Ontario
M5S 3B1
Canada
RE: Radiocarbon analysis results, *Alex Cebulski Msc Thesis*

Dear Mr. Cebulski and Dr. Desloges,

Please see below for radiocarbon analysis results for two wood samples received 2017-11-10. Your samples were processed without issue.

The preparators for your samples were Sarah Murseli and Carolyn Dziawa, and the AMS analyst was Dr. Xiao-Lei Zhao. If you have specific questions about the analyses or calibration, please direct them to smurseli@uottawa.ca. If this data is used in publication or for a graduate thesis, we would appreciate a copy of the abstract for our records. In the interest of future researchers, we encourage you to take the time to submit your radiocarbon results to either the Canadian Archaeological Radiocarbon Database (CARD), or to the Neotoma Paleoecology Database.

Thank you for choosing the André E. Lalonde AMS Laboratory. We look forward to working with you again.

Sincerely,

Dr. W. E. Kieser
Director, A. E. Lalonde AMS Laboratory
Associate Professor, Department of Physics
25 Templeton St., Ottawa, ON, K1N 6N5, Canada
www.ams.uottawa.ca

Sample Processing
Sample pretreatment techniques and definitions of media codes can be found in Crann et al. (2017). For more information about the equipment used for sample preparation, please see St-Jean et al. (2017). Both manuscripts can be found at www.ams.uottawa.ca/Research

Reporting of Data
In this analysis report, we have followed the conventions recommended by Millard (2014).

Radiocarbon Analysis
Radiocarbon analyses are performed on a 3MV tandem accelerator mass spectrometer built by High Voltage Engineering (HVE). $^{12,13,14}C^{+3}$ ions are measured at 2.5 MV terminal voltage with Ar stripping. The fraction modern carbon, $F^{14}C$, is calculated according to Reimer et al. (2004) as the ratio of the sample $^{14}C/^{12}C$ ratio to the standard $^{14}C/^{12}C$ ratio (in our case Ox-II) measured in the same data block. Both $^{14}C/^{12}C$ ratios are background-corrected and the result is corrected for spectrometer and preparation fractionation using the AMS measured $^{13}C/^{12}C$ ratio and is normalized to $\delta^{13}C$ (PDB). Radiocarbon ages are calculated as -8033ln($F^{14}C$) and reported in ^{14}C yr BP (BP=AD 1950) as described by Stuiver and Polach (1977). The errors on 14C ages (1σ) are based on counting statistics and $^{14}C/^{12}C$ and $^{13}C/^{12}C$ variation between data blocks. We do not report $\delta^{13}C$ as it is measured on the AMS and contains machine fractionation.

Calibration
Calibration was performed using OxCal v4.2.4 (Bronk Ramsey, 2009). Calibrated results are given as a range (or ranges) with an associated probability as point estimates (mean, median) cannot represent the uncertainties involved (Millard, 2014). We acknowledge that point estimates are often desired and are thus included on the calibration plots in the Appendix, but we recommend that data tables used in publication maintain calibrated age ranges.

Where the $F^{14}C$ is less than 1, the IntCal13 calibration curve was used for Northern Hemisphere samples and ShCal13 for Southern Hemisphere samples (Reimer et al., 2013).

For samples with an $F^{14}C$ greater than 1, the post-bomb atmospheric curve was used (Hua et al., 2013). Post-bomb samples have two age ranges due to calibration on both sides of the bomb pulse. There are methods for deciding which side of the bomb pulse to select as the more appropriate date so feel free to contact us for further information.

Samples that calibrate between the 1700's and early 1950's will always result in a calibrated age range covering the majority of this period. This is due to the "Seuss Effect", which is a flat portion of the calibration curve caused by the burning of fossil fuels.

Rounding
Calibrated ages and ranges are rounded to the nearest year which may be too precise in many instances. Users are advised to round results to the nearest 10 yr for samples with standard deviation in the radiocarbon age greater than 50 yr, but rounding should only be done at the final reporting stage as intermediate rounding may introduce errors (Millard, 2014).

References

Bronk Ramsey C. 2009. Bayesian analysis of radiocarbon dates. *Radiocarbon* 51: 337–360.

Crann CA, Murseli S, St-Jean G, Zhao X, Clark ID, Kieser WE. 2017. First status report on radiocarbon sample preparation at the A.E. Lalonde AMS Laboratory (Ottawa, Canada). Radiocarbon 59(3): 695–704. http://doi.org/10.1017/RDC.2016.55

Hua Q, Barbetti M, Rakowski AZ. 2013. Atmospheric radiocarbon for the period 1950-2010. *Radiocarbon* 55(4): 2059–2072.

Millard A. 2014. Conventions for reporting radiocarbon determinations. *Radiocarbon* 56(2): 555–559.

Reimer PJ, Bard E, Bayliss A, Beck JW, Blackwell PG, Bronk Ramsey C, Buck CE, Cheng H, Edwards RL, Friedrich M, Grootes PM, Guilderson TP, Haflidason H, Hajdas I, Hatté C, Heaton TJ, Hogg AG, Hughen KA, Kaiser KF, Kromer B, Manning SW, Niu M, Reimer RW, Richards DA, Scott EM, Southon JR, Turney CSM, van der Plicht J. 2013. IntCal13 and MARINE13 radiocarbon age calibration curves 0-50000 years calBP. Radiocarbon 55(4): 1869–1887.

St-Jean G, Kieser WE, Crann CA, Murseli S. 2017. Semi-automated equipment for CO2 purification and graphitization at the A.E. Lalonde AMS Laboratory (Canada). Radiocarbon 59(3): 941–956. https://doi.org/10.1017/RDC.2016.57

Stuiver M, Polach HA. 1977. Discussion: reporting of 14C data. Radiocarbon 19(3):355–63.

Table 1. Radiocarbon results. Calibration was performed using OxCal v4.2.4 (Bronk Ramsey, 2009) and the IntCal13 calibration curve (Reimer et al., 2013). Material codes are described in Crann et al. (2017).

Lab ID	Submitter ID	Material	Mat. Code[a]	^{14}C yr BP	±	F^{14}C	±	cal BP
UOC-5416	CBV1-_346	twig	AAA	1913	21	0.7881	0.0021	1899-1819 (94.2%)
UOC-5417	CBV2+_220	twig	AAA	351	21	0.9573	0.0025	490-421 (42.7%) 407-316 (52.7%)

Appendix – Calibration plots