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St. John River Valley Dendroarchaeology: Johnny Buxton Barn, Woodstock, N.B.

By

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Abstract

The John Buxton structures were analyzed with the overall goal to obtain dates of construction from three structures located on the Buxton property near Woodstock, New Brunswick. Standard dendroarchaeology crossdating techniques were used to establish cut dates for board, and beam samples from each of the structures. Cut dates of 1909 were confirmed at two of the buildings, with a series of younger dates established for individual boards and beams in the structure. This probably suggests that some of the material used to construct the structures were reused from buildings of an earlier origin.

Introduction

The St. John Valley extends from northwestern New Brunswick to the industrial centre of St. John, where it empties into the Bay of Fundy. The region has a significant relevance to the historical culture of New Brunswick and surrounding areas. The people who settled here in the 18th and 19th centuries, established firm connections with the land and its resources. They were a self-sufficient agricultural people who erected numerous large buildings, many of which remain standing today. The abundance of large pine, spruce and cedar in the St. John Valley and their physical characteristics made them ideal as a construction material source. Today, the boards and beams utilized in the construction of old structures have a high monetary value because of their size and strength, and the structures are commonly being disassembled for profits from the sale of the wood. This wave of deconstruction is to the detriment of the local people with a family heritage in the area as much of their history is being lost.

This report details the work of the Mount Allison Dendrochronology Lab (MAD Lab) in attempting to accurately date one of these historic barns located near Woodstock, New Brunswick. The data derived from this study can be subsequently used to date other structures in the region, and aid in the preservation of the historical integrity of the St. John River Valley. This project also serves as an exercise in the development of dendrochronological techniques at Mt. Allison University, as it is one of the first studies of its kind to take place in the MAD Lab. Relatively little work has been done throughout the Maritimes as a whole in the field of dendrochronology, therefore this project will provide the foundation upon which to expand this field of study throughout the region.

This report focuses on the John Buxton structures and addresses all of the specific details required to complete the analysis. The overall goal was to use standard dendrochronological techniques to analyze samples obtained from three structures located on the Buxton property near Woodstock, New Brunswick. Although the approximate dates of construction of these structures were known, the owner wished to confirm the dates of their construction as some of the boards could have been translocated from other structures in the past into the present day structures.

To accurately date the John Buxton structures, the research question was broken down into two smaller components:

-The development of a white pine (*Pinus strobus*) master chronology for the St. John Valley area extending back in time far enough to date all three structures in question.

-Crossdating and confirming the kill dates of logs and planks within the three John Buxton structures, located in Woodstock, New Brunswick.

It was anticipated that a master white pine chronology from samples taken from living trees would crossdate with white pine samples taken from boards from the Buxton structures. Dating of the Buxton structures could then extend the living white pine chronology back in time far enough to crossdate with samples from other older structures in the region. It was assumed that, because of the historical usage of white pine as a building material, and the colour and textures of the barn board samples, it would be a wise choice as a focus species upon which to base the living master.

The three structures of interest located on the Buxton property are a barn, a shed, and a granary. There is a high level of confidence that their dates of construction fall roughly around 1910, but it is unknown whether all three structures were built in the same year. Each structure, therefore, will be considered independently of one another for the purpose of this study. Samples of beams and boards were collected from each structure and sent to the MAD Lab by John Allison. They were received in early March, 2004, issued identification codes, identified by species and analyzed using visual methods and correlation techniques. We wished to determine whether samples were related to each other, and if these samples could be positively dated.

Research Methods

The science of dendrochronology relies on evidence that trees produce one annual growth ring per growing season, and that the corresponding ring growth patterns are characteristic to specific species. Furthermore, species growing in areas under similar environmental variables will illustrates remarkably similar patterns of annual growth in response to those variables (Stokes and Smiley, 1996). These resemblances in pattern allow for the development of master chronologies for a given species, which can subsequently be used to crossdate unknown samples of the same species to determine their last year of growth. When these samples come from old or historic structures, this particular field of dendrochronology is termed dendroarchaeology. Similar practices date back to the early 1900's when A.E.Douglass began adapting his studies of pine species to develop a dating method for archaeologists (Baillie 1982).

Preparation of disc and board samples included cutting them down to smaller sizes and sanding them with progressively finer paper (50 to 600 grit) to allow for visual analysis of cell structure and ring detail. These details are key in establishing the species of each sample and in defining ring boundaries when measuring.

Eight living white pine trees were sampled in the Florenceville area of the St. John Valley to develop a living chronology to use for crossdating the Buxton samples. The trees were sampled at breast height, and two samples were taken from each tree at angles perpendicular to each other. Sampling took place late in February, 2004 and the specimens obtained were still partially frozen. It is believed that this contributed to their frailty, as most of the samples were brittle and broke up upon extraction. This factor left us with a very small quantity of cores that were usable for developing a master chronology.

The outcome of the living samples yielded a small sample sized master chronology with a very weak correlation. Because of the unreliability of our living chronology, an extended white pine chronology was obtained from Dr. André Robichaud from the University de Moncton to use in the analysis instead. Although his chronology was developed from trees sampled in Haute-

Aboujagane, New Brunswick, we believed it to be a much more useful tool for crossdating than the poor cores we collected in the St. John Valley.

Visual analysis of the samples obtained from the Buxton property showed that there were at least three different species present, and only one single sample appeared to be from the *pinus* genera. The methods of species identification employed visual analysis of cellular structures and growth patterns. Pine was identifiable by the prominent presence of resin ducts; cedar by its thick cell walls of latewood and prominent radial paranchyma; and spruce by its thin cell walls and lack of resin ducts or prominent paranchyma.

Sampling of the structures was conducted by the owner, yielding good quality samples overall. Table 1 lists known details of each sample obtained from the Buxton property. Once processed, measured, analyzed and quality checked for errors, the samples were grouped according to the structure from which they came, and then in sub-groups of similar species. These small groups of samples were analyzed independently using program COFECHA to establish the best possible correlations among individual structures and specific species. Upon completion of this analysis, the samples were crossdated with the living white pine master chronology with the goal of narrowing down the possible construction date of the structures to a specific period of time.

Table 1. Detailed description of samples obtained from Johnny Buxton barn: Woodstock, New Brunswick, February 2004.

SAMPLE ID	MAD Lab Code	TYPE	STRUCTURE	SPECIES	#YEARS
JB-1	04DS001	Cookie	Shop	Cedar	131
JB-2	04DS002	Cookie	Shop	Cedar	122
JB-3-A	04DS003	Board	Barn	Cedar	160
JB-3-B	04DS011	Board	Barn	Cedar	155
JB-3-2-A	04DS003	Board	Barn	Cedar	190
JB-3-2-B	04DS012	Board	Barn	Cedar	171
JB-3-2-C	04DS006	Board	Barn	Cedar	188
JB-4	04DS004b	Cookie	Shop	Spruce	67
JB-4-A	04DS004a	Cookie	Shop	Spruce	67
JB-4-B	04DS07a	Cookie	Shop	Spruce	57
JB-4-C	04DS007c	Cookie	Shop	Spruce	57
JB-4A-1	04DS010	Board	Barn	Spruce	24
JB-4A-2	04DS009	Board	Barn	Cedar	172
JB-4A-3	04DS008	Board	Barn	Cedar	68
JB-5	04DS005	Cookie	Granary	Pine	70

Structure Analysis

SHOP

There was a total of six samples received from Johnny Buxton's shop, comprised of spruce and cedar species (Figure 1). The samples were first crossdated with one another to determine whether there was a general relationship between them. This initial analysis resulted in a very weak correlation using COFECHA. It was then decided to break the group up into similar species in an attempt to establish a relationship. Samples JB1 and JB2 were both determined to be spruce, so they were then crossdated against one another. The result again, however, was a very weak correlation. JB2 had bark to the last year of growth indicating that if a significant correlation was established using that sample, that it would point to the exact last year of growth. Therefore, the last year of growth for JB2 was held at 1910 and the other samples were floated against it with the hope of establishing where the samples might correlate with one another. Unfortunately, again the results did not yield a significant correlation. The cookie series JB4-JB4C were determined to be spruce, and by their physical similarities they also appeared to be sampled from the same beam. COFECHA results strongly supported this hypothesis, illustrated by a 0.670 correlation coefficient.

Overall, the Johnny Buxton shop did not yield the favourable results sought in the study. We were unable to correlate all samples together, but the high correlation of the JB4 series indicates that the potential exists for strong crossdating results.

Figure 1 - Johnny Buxton Shop, Woodstock, N.B., March 2004.

BARN

The initial analysis of the barn (Figure 2) was done using all samples obtained from the structure (see Table 1). The resulting correlation was 0.091. This was very weak. Attempts were made to improve the correlations. However, the data still pointed to outliers in JB32A, JB4A2, and JB4A3.

JB4A1 was the only sample from the group with visible bark, however, it only contained a small number of years of growth. Because of this, it was difficult to establish a significant correlation by floating other samples in the group against it as they were often much larger with many more rings. Of all of the barn samples, JB4A1 was also the only apparent spruce sample. The rest were identified as a cedar species, and from the initial barn analysis did not appear to correlate well.

Figure 2 - Johnny Buxton Barn, Woodstock N.B., March 2004.

GRANARY

There was only one sample taken from the granary (Figure 3) which also appeared to be the only pine sample from the entire set (JB5). Analysis of the granary was very limited because of this. The sample taken was a disc with abundant visible bark meaning that if it could be correlated with any other samples, it would point to the exact last year of growth. Since the one sample was pine, however, it was hoped that it could be crossdated easier with the white pine master chronology obtained from Dr. Robichaud of the University de Moncton.

Figure 3 - Johnny Buxton Granary, Woodstock N.B., March 2004.

Results

Although Dr. André Robichaud's chronology was not shared with the MAD Lab in a decadal format, visual analysis of its COFECHA output suggested that it contained a very strong internal correlation. The was used with some confidence as a master chronology with which to crossdate samples from the Buxton structures. Since there was only one apparent pine sample (from the granary) out of the entire Buxton sample series, the objective evolved to try to identify any possible correlations between the white pine master and the cedar and spruce samples, even if they were weak.

All sample data was first floated in their entirety against the master white pine chronology using COFECHA to determine if any of the samples correlated well at any point along the living master. The result showed that some small groups of samples correlated very well with the master chronology.

Shop and Barn

The first group of samples included: JB4A3, JB4, JB4A, JB4B, and JB4C. As a floated series of samples, COFECHA suggested that by changing the last year of growth back 27 years from 1910 to 1883 would result in a higher correlation with the master. The result yielded an overall correlation of 0.294, with the original master, close to statistical significance. The JB samples correlated with the master very well, even though they were of a different species. All of the JB4 samples had apparent wormwood indicating that bark, although not visible, was once present on those samples. Samples containing bark or wormwood are the most favourable samples to crossdate with a master for our purposes, in that their correlation could potentially point to an exact last year of growth. There is a strong possibility therefore that the tree in which the JB4 samples came from was indeed felled in 1883. Although this result does not support hypothesized construction date, the possibility exists that the tree may have died 1883 but remained standing until it was harvested for construction, or more likely, was felled in 1883 and reused in the new construction of the structure in 1910. JB4A3 correlates strongly with this sub-sample group, but has no apparent bark. This suggests that the actual construction of the structures was after 1883, because the lack of bark indicates that some rings would most likely be lost when preparing the boards for construction. The high correlation among the JB4 samples also establishes a link between the shop and the barn, providing evidence that they were probably built at the same time.

JB4A1 had visible bark and was crossdated with the white pine chronology. COFECHA results indicated that by taking one ring off of the sample's kill date would result in a higher correlation than their current last year of growth of 1910. This was done and the subsequent COFECHA output did indeed yield higher correlations. JB4A1 correlated at 0.444.

Granary

The analysis carried out on the granary sample compared JB5 to the white pine chronology. The original JB5 was added to master chronology and a COFECHA output resulted suggested to take one year of the last year of growth, making it 1909. Once this was done in EDRM, the second COFECHA output resulted in a correlation of 0.125. Although this value was still not significant by COFECHA standards, changing the last year of growth to 1909 increased the correlation by a significant amount..

Construction Dates

Thus far, the resulting evidence supports the hypothesized date of construction as 1910. There is a high probability that the 1909 dates for JB4A1 and JB5 are correct because of the correlation evidence and building practices at the time. It is highly likely that if the structures were indeed built in 1910, then the trees used for construction wouldn't have likely had a chance to grow an annual ring for that year. The last year of growth would logically have been 1909 if construction took place in 1910, supporting the hypothesis and evidence of the construction date. The trees used would have most likely been cut in the late fall or winter of 1909 or early spring of 1910, eliminating the opportunity to grow a ring for the 1910 growth year.

The last group of samples tested with the white pine chronology was the sub-series: JB3A, JB3B, JB3-2B, JB3-2C. These were all board samples with no visible indication of bark. Floating as an undated series, COFECHA suggested that the last year of growth for these samples be adjusted to varying degrees, taking off 16, 5, 20 and 18 years respectively. The results gave a correlation with the master of between 0.056 and 0.266. These values are fairly weak, but are positive nonetheless. With the development of master chronologies for spruce and cedar species found in the St. John region, much higher correlations are expected.

Conclusions

Although analysis of samples obtained from Johnny Buxton's property have not yielded many strong correlations thus far, that does not mean that accurate dating of the structure(s) is not possible. To begin, the rationale for choosing white pine as a focus species was logical and relevant to the study area, however it turned out not to be the best choice for this analysis. Sampling spruce and/or cedars in the area would have likely yielded a master that could have provided much more accurate crossdating correlation values. The white pine master chronology, however, did prove useful in establishing some weak correlations. These correlations illustrate two things in this study: (1) The data collected thus far appears to point to 1910 as the year of construction, and (2) There is evidence that crossdating between species and between distances should be possible.

Th Buxton structures appear to be composed mainly of cedar and spruce. Further analysis of the samples to determine their exact *species* of spruce and cedar is the next step in dating methods. Once this information is positively established, confident master chronologies can be made for both, giving the ability to crossdate the samples already obtained.

References

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