MAD LAB

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Dating the Dugas House

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Abstract

This research project was carried out to establish the date of construction of an Acadian structure located in the Village Historique Acadien (VHA), near the town of Caraquet, New Brunswick. The structure in question is locally known as the Dugas House. The structure has a questionable origin, so the MAD Lab was contacted by Mr. John Leroux to determine the exact age of the timbers in the structure. In cooperation with Mr. Roger Boucher at the VHA, ten wood cores were taken from timbers by accessing them through the upper story of the building. The annual growth rings of the wood were measured to 0.001 mm precision at the Mount Allison Dendrochronology (MAD) Laboratory, using a WinDENDRO measurement system. All samples proved to be eastern white cedar (*Thuja occidentalis*). The pattern of annual variation of each sample was matched against existing growth records from the region to determine the date at which the timber was felled. Confident statistical and visual terminal dates were found for eight timbers from the structure, and a date of construction was extrapolated from this information. Wood was felled for most beams in the 1860s, and two samples had the outside rings present with cut dates of those pieces being 1866 and 1867. Following building practices of the day, the construction date of the structure was probably 1867 - 1868.

Introduction

In the early 1970s, efforts were begun to uncover some of the rich Acadian history in New Brunswick and preserve it for present and future generations. The Village Historique Acadien (VHA) was established near Caraquet, in northern NB, as a living museum depicting Acadian life. Historical buildings from around the province were researched for their value as cultural artifacts; some were then donated or purchased by the VHA and moved to the Village site. At the VHA these buildings were restored to what was concluded to be their original condition. The variety of buildings – houses, shops, outbuildings, and even a church – at the VHA today reflect the evolution of Acadian lifestyles from the late 1700s to the early 1900s.

While previous MAD Lab research has been done to age some of these buildings, it always remains difficult to confirm a supposed date of construction from the limited visual clues present in particular structures. Few written records exist regarding details surrounding the construction of private building, and oral histories passed down through time are often difficult to assess without additional information and proofs. Architectural styles can also be a poor indicator, as construction techniques often outlived their time period in remote, isolated villages. Size of buildings, parish records, government censuses and correspondences can help shed light on the lives of past inhabitants, but offer limited help in fixing the buildings into time, especially when they precede the first written record.

In the summer of 2007, Mr. John Leroux approached the Mount Allison Dendrochronology (MAD) Laboratory in the hopes of finding or confirming construction dates for a particular structure on the VHA property, the Dugas House (Figure 1). This report describes the process that was undertaken to conduct this research.

Figure 1: The Dugas House in the Village Historique Acadien, near Caraquet, NB.

Methods

Ten increment core samples were taken from the Dugas House. The staff of the facility prepared openings to the main timbers in the structure by removing panels on the walls to provide access to the upright beams on the upper floor of the building (Figure 2). The cores were extracted using manual increment core-boring tools. A team of four researchers from the Mount Allison Dendrochronology (MAD) Lab, accompanied by VHA staff, sampled the building on July 27, 2007.

Figure 2: Openings in the paneling were created to gain access to ten main upright beams. A researcher is shown using an increment boring tool to collect a 4.3 mm sized dowel from the beam.

Sample preparation took place in August 2007 at the MAD Lab. Individual samples were glued onto grooved mounting boards using wood glue. Pieces of some cores were set aside for identification using a scanning electron microscope procedure. Some visible characteristics were recorded at this time, where they were clearly evident. When the glue was dry, the boards were sanded using belt sanders and a series of progressively finer grits ranging from 80 to 400.

Sanded samples were measured using a WinDENDRO computer program. WinDENDRO measurement involved scanning a sample board using a flatbed scanner at a resolution between 300 to 2000 dpi. Measurement paths were drawn manually on the scanned image, and manual checks were made to the program's initial ring detection by an operator. The distance between ring boundaries were measured and saved as a text file on a computer.

Prior to further analysis, it was important to determine the tree species used in the construction of the structure. All tree species have different growth responses to climatic factors, and they incorporate these differences into a unique growth pattern for the region, for each species. Thus, small parts of the extracted samples were examined using a scanning electronic microscope (SEM) to confirm the species of the samples.

The process of analyzing the ring pattern data requires two steps. The first is to crossdate the samples within the structure to each other. Crossdating is the process of matching growth-rings between trees in a sample set. This ensures that there is a significant correlation between the growth patterns of the trees within the building (representing a stand of trees that was growing together and thus should have similar growth trends). This is done visually and statistically using a computer program called COFECHA.

Results and Discussion

All samples in this analysis were determined to be eastern white cedar (*Thuja occidentalis*). Based on this information, a base chronology for the cedar growth pattern in the region where the building originally came from was extracted from the MAD Lab data base. This base chronology covered the time period from the 1630s until present day and was used in all of the other comparative analyses that required a locked-in-time chronology.

Based on an analysis of the ring measurements using COFECHA, it was determined that in general the samples from the building crossdated well with each other. This suggests that the trees used in the construction of the building were cut down within close proximity to each other. Based on construction and logistical schedules of the past, it is reasonable to believe that the trees were felled green in the fall/winter of the year before construction began. Samples were often hauled in the winter, and then dried for some time, before they were shaped and incorporated into a structure during the warmer months.

The data file for the building samples were COFECHA matched against the existing MAD Lab chronologies from New Brunswick (#05KS700). The program statistically suggested an adjustment that allowed the floating-in-time series from the building to be dated according to the locked-in-time data provided by the 05KS700 series.

Of the 10 core samples taken from the building, 8 were dated with a statistically significant correlation, and the 2 other cores were not able to be dated (#001 and #006, see Table 1). The terminal dates found for these 8 cores ranged from 1829 to 1867, with most clustering in the 1860s (Table 1). The two samples that retained bark, and hence were able to provide exact terminal dates when the trees were cut, were found to be 1866 and 1867.

The Dugas House was estimated by VHA researchers to be built in 1855. Terminal ring data would suggest a construction date of the mid-1860s. Although a few pieces of wood may have been recycled from previous buildings, most of the dates that we found suggest at least a mid-1860s date. Samples with a slightly earlier date than 1867 usually had perimeter loss of the wood, where a beam was squared off or wood was lost due to age related degradation (Table 1).

Table 1: Tree-ring dating results of the Maison Dugas, Village Historique Acadien.

Sample ID	species	Sample location	Last growth ring	Date of last ring	Cut date
07BQS001	cedar	wall post	no	?	?
07BQS002	cedar	wall post	no but close	1860	?
07BQS003	cedar	wall post	yes	1867	1867
07BQS004	cedar	wall post	yes	1866	1866
07BQS005	cedar	wall post	no but close	1860	?
07BQS006	cedar	wall post	no	?	?
07BQS007	cedar	wall post	no but close	1860	?
07BQS008	cedar	wall post	no	1847	?
07BQS009	cedar	wall post	no	1860	?
07BQS010	cedar	corner post	no	1856	?

The statistical and visual characteristics of the pattern matches were of very high quality. Figures 3 to 6 illustrate the visual pattern matches of four of the cores. The base chronology easily extends over the entire length of the cores from the Dugas House, and the Dugas samples follow the base chronology pattern very well over this period. A standard in dendrochronology is to have at least a 50-year overlap between patterns to be sure that the determined terminal date is reliable. For these samples, patterns of overlap ranged from 100 (e.g., Figure 6) to over 200 years (e.g., Figure 4) of continuous match, which leaves little to no doubt as to where each sample from the structure fits in time.

Conclusion

Ten samples were taken from the Dugas House in the hope that they would help to establish a more scientifically sound construction date for the structure. Eight of the 10 beam samples were dated, with very good overlap and pattern matches made between the base chronology and the individual beam data. Most of the beams had data that extended to the 1860s, with two samples that had bark present indicating cut dates of 1866 and 1867. It is therefore our interpretation that the structure in question was most probably built in 1867-1868.

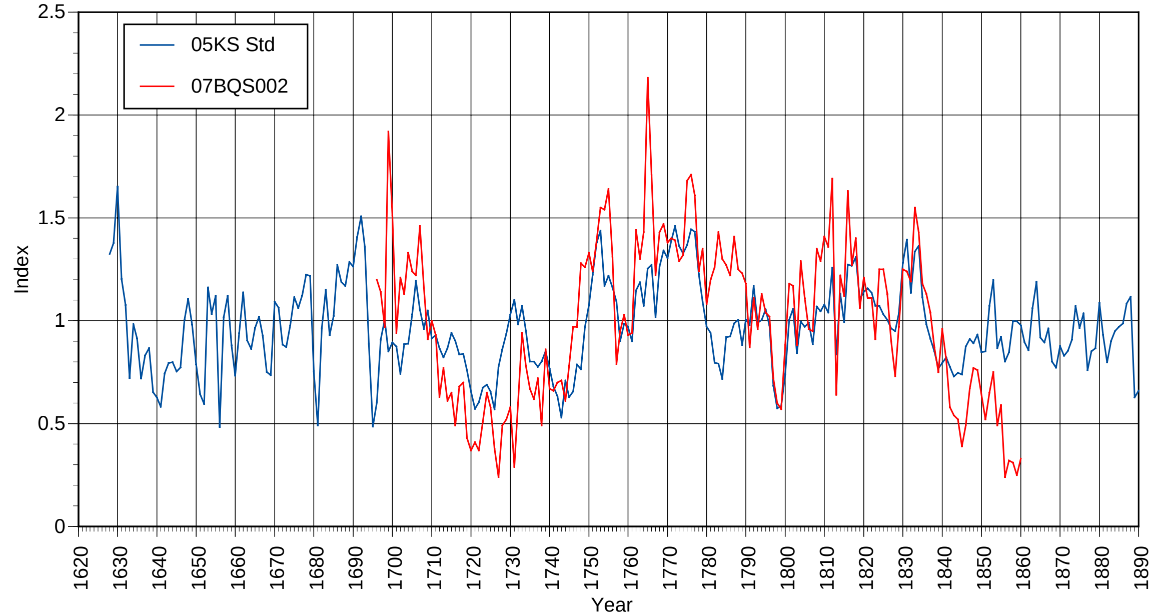

Figure 3: A growth comparison between a sample from the Dugas House (#07BQS002) and the regional base chronology for white cedar (#05KS700). The average growth increment is 1.0 and all growth above one is higher than average radial growth, while values below 1.0 are below average. The patterns illustrate a close relationship continuously for 170 years.

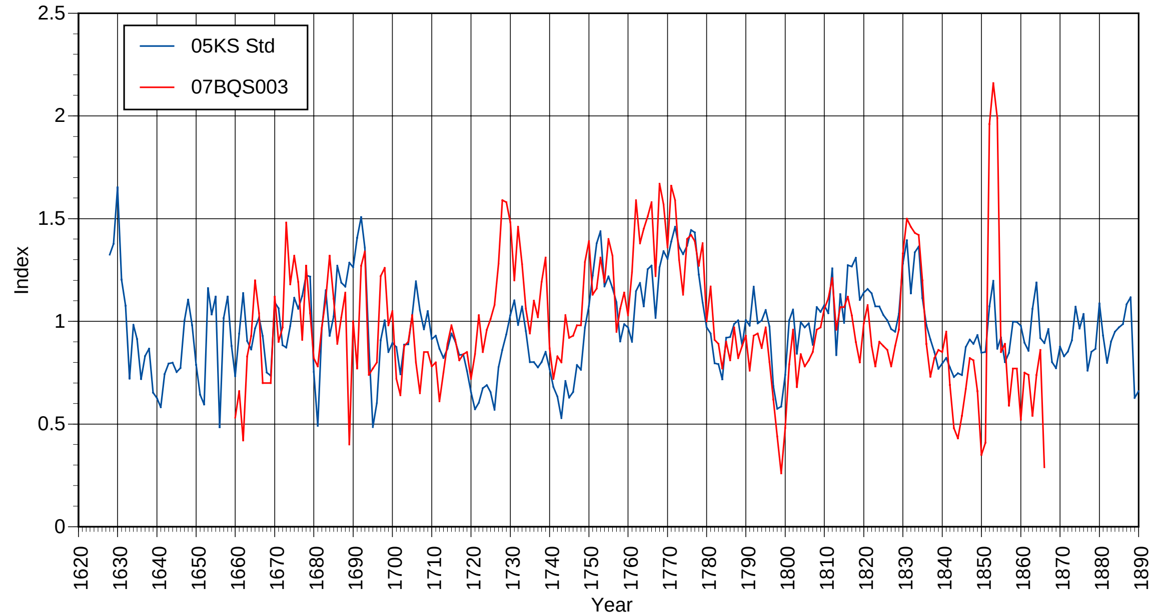

Figure 4: A growth comparison between a sample from the Dugas House (#07BQS003) and the regional base chronology for white cedar (#05KS700). The average growth increment is 1.0 and all growth above one is higher than average radial growth, while values below 1.0 are below average. The patterns illustrate a close relationship continuously for 200 years.

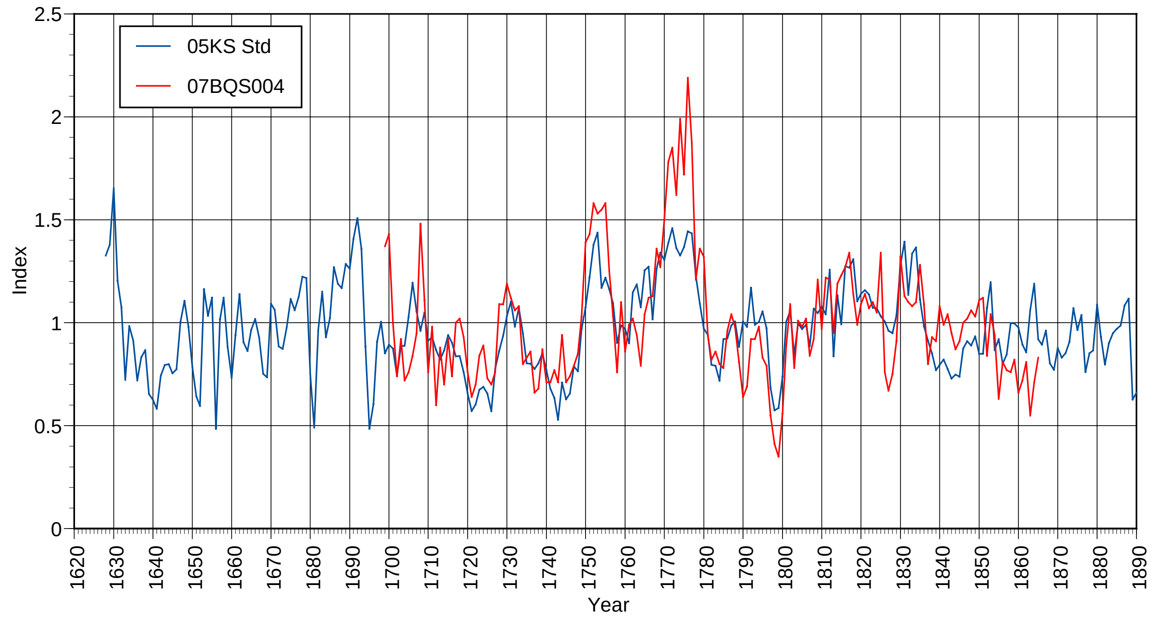

Figure 5: A growth comparison between a sample from the Dugas House (#07BQS004) and the regional base chronology for white cedar (#05KS700). The average growth increment is 1.0 and all growth above one is higher than average radial growth, while values below 1.0 are below average. The patterns illustrate a close relationship continuously for 160 years.

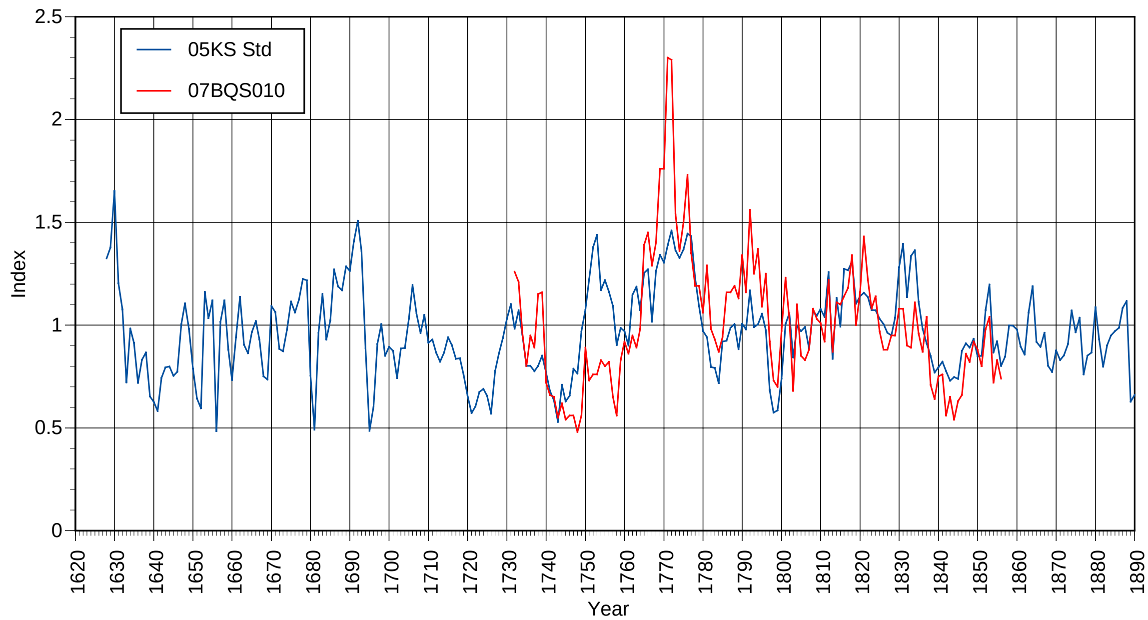

Figure 6: A growth comparison between a sample from the Dugas House (#07BQS010) and the regional base chronology for white cedar (#05KS700). The average growth increment is 1.0 and all growth above one is higher than average radial growth, while values below 1.0 are below average. The patterns illustrate a close relationship continuously for120 years.