Mount Allison
Dendrochronology Lab

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A Dendroarcheological Analysis of Barrington Meeting House: Barrington, Nova Scotia

By

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Table of Contents

Abstract

Twenty-one tree-ring samples were taken from beams in the Barrington Meeting House in Barrington, Nova Scotia. The sampling was conducted in efforts to extend the Mount Allison Dendrochronology (MAD) Lab chronologies for southwestern Nova Scotia using historic structures. Statistical analysis was conducted on the red spruce (*Picea rubens*) samples to deduce the tree-ring growth patterns of the species for the region. Based on analysis, it was determined that the trees used in the construction of the church were felled in 1763-1764, supporting the records that the church was built in 1765.

Introduction

Churches in Nova Scotia are the pride of many communities and as such have been maintained for many centuries by their parishioners. Southwestern Nova Scotia has a wealth of churches that have been built and cared for by the earliest settlers. Not only are these churches rich in cultural history, the wood used to construct them holds a wealth of information on the environment of the region up to the time of initial settlement.

Dendroarcheology is the study of tree rings taken from beams in historical structures. The purpose of this project is to understand how several tree species were growing in southwestern Nova Scotia at the time of settlement. Samples were taken from eight historical churches in the region to accomplish this goal. Master chronologies of radial growth from each tree species, at each church, were constructed, with the ultimate goal of adding growth patterns to existing regional chronologies to extend radial growth records for each tree species in the region. This method of collecting tree-rings is used in southwestern Nova Scotia because the majority of the region's old-growth forests have been cut down, and therefore shortening the length of the record accessible from live trees. Beams from historic churches provide records of tree-ring growth of what would be the region's old-growth forests, if they were standing today.

The Barrington Meeting House in Barrington, Nova Scotia (MAD Lab #06RS000) was one of the eight churches the Mount Allison Dendrochronology (MAD) Lab sampled in the summer of 2006 (Figure 1). According to church records and the book *Thy Dwellings Fair: Churches of Nova Scotia 1750-1830*, the church was constructed in 1765. (Duffus et al, 1982: 65.) Due to its age, there was potential for the tree-rings in the church beams to extend quite far into the past. With the support of the historical society, sampling was conducted.

Figure 1: Barrington Meeting House, Barrington, N.S.

Research Methods

Samples were taken from a total of twenty-one beams using an increment borer (see Appendix A). The diameter of each sample is 4.3 mm, approximately the size of a pencil (Figure 2). The sampling process has no negative effects on the structural integrity of the building. All of the beams sampled are located in the attics of the church, where they have not been altered since the building was constructed. Beams were selected for sampling according to their integrity (the absence of rot) and the presence of bark (indicating the last tree-ring has not been removed in the construction of the church).

Samples were stored in plastic straws and were transported back to the lab to be prepared for analysis. Each core was glued into a slotted mounting board. The cores were sanded using up to 600 grit sandpaper in order to ensure a clear cross-section of the rings. The cores were then measured using a 63x light microscope and the Velmex measuring system. This process produced measurements indicating the annual growth rates of the individual trees to 0.001 mm.

Prior to further analysis, it was important to determine the tree species used in the construction of the church. As all tree species have different growth responses to climatic factors, to compare growth patterns of a set of samples they must be of the same species. Although the bark on the samples collected gave some indication that beams were red spruce (*Picea rubens*), three samples were examined using a scanning electron microscope (SEM) to confirm the identification. Two samples were confirmed as to be red spruce, and one was

confirmed to be oak (*latin*??). Based on the characteristics of the other samples, it was inferred that all of the other beams were red spruce.

The process of analyzing archeological data requires two steps. The first is to crossdate the samples within the church to each other. 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). Once this was completed, the church beams were crossdated into a red spruce chronology constructed by the MAD Lab from live trees and structural samples obtained from New Brunswick and Nova Scotia.

Figure 2: Sample extracted with an increment borer.

Results and Discussion

Based on an analysis using COFECHA, it was determined that the last year of growth of the trees within the church beams was 1820 (Figure 3, Table 1). This suggests that the trees used in the construction of the church were cut down with the last growing year being 1763-1764, approximately two years before the building was constructed. Based on construction and logistical schedules of the time, it is reasonable to believe that the trees were felled in the fall/winter of the year before construction began, and it likely took more than one year to construct the structure. This fact confirms the records of the Barrington Meeting House being constructed in 1765.

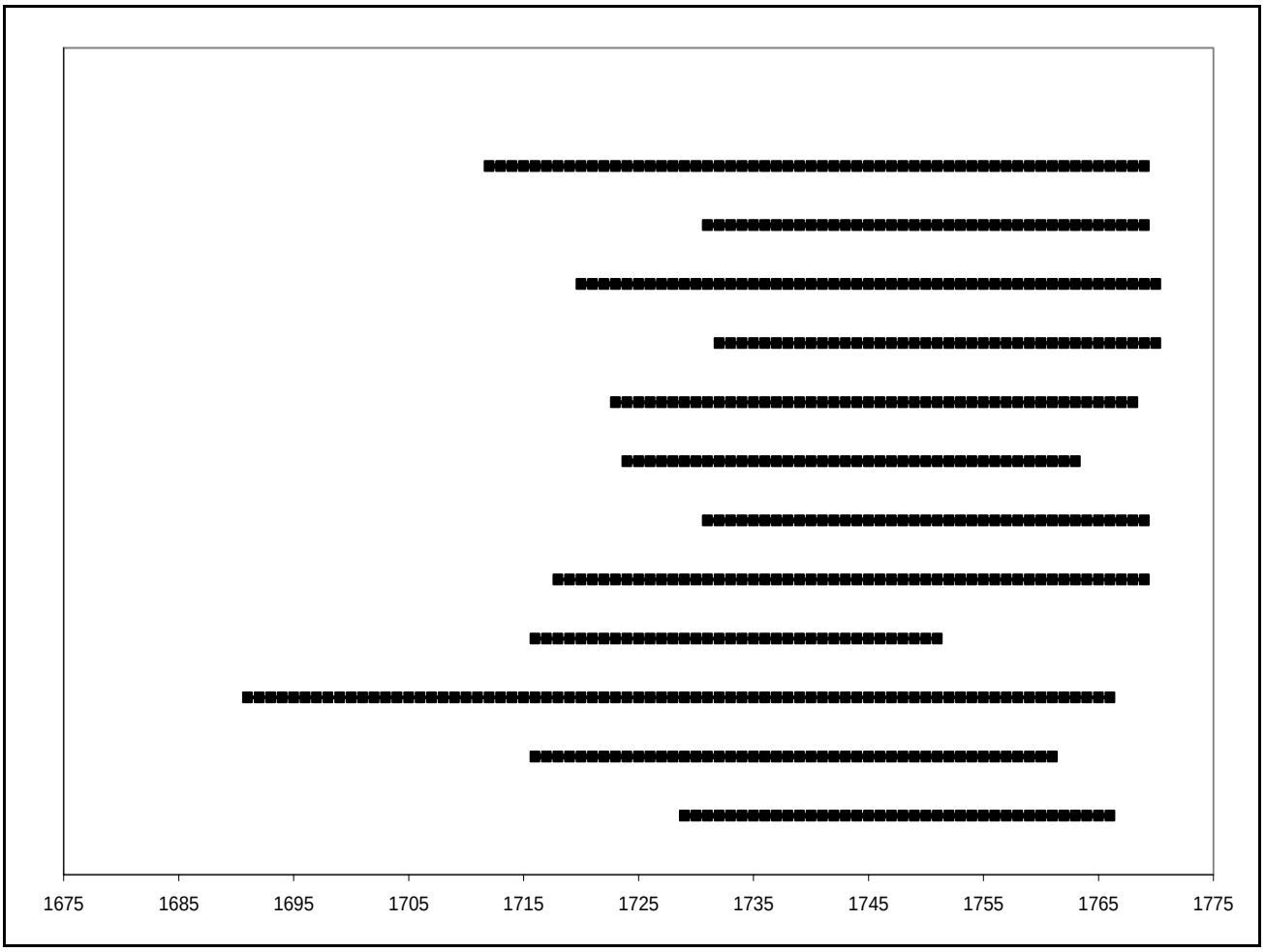


Figure 3: Life-spans of trees within beams of the Barrington Meeting House.

Sample Number	*Location*	*Bark Condition*	*Species*	*Crossdated Interval*
06RS003	attic	no bark present	Red spruce	1729-1766
06RS004	attic	no bark present	Red spruce	1716-1761
06RS005	attic	bark present	Red spruce	1691-1766
06RS008	attic	no bark present	Red spruce	1716-1751
06RS009	attic	bark present	Red spruce	1718-1769
06RS010	attic	bark present	Red spruce	1731-1769
06RS011	attic	no bark present	Red spruce	1724-1763
06RS012	attic	bark present	Red spruce	1723-1768
06RS013	attic	bark present	Red spruce	1732-1770
06RS015	attic	bark present	Red spruce	1720-1770
06RS016	attic	bark present	Red spruce	1731-1769
06RS018	attic	no bark present	Red spruce	1712-1769

Table 1: Data on samples collected from beams within the Barrington Meeting House.

Once the cut years of the trees were determined, it was possible to create a floating chronology for the "stand" (Figure 4). This shows the average growth patterns for all of the red spruce samples within the beams of the church.

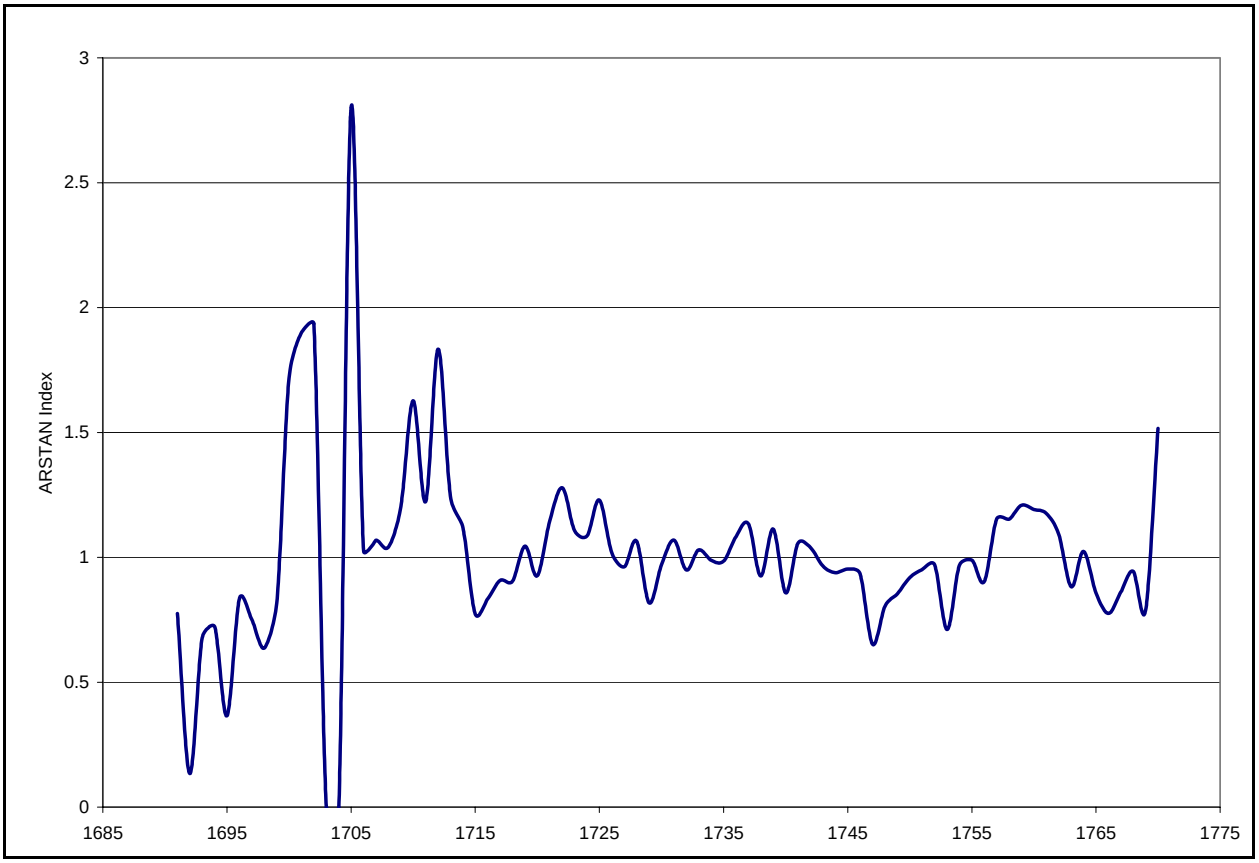


Figure 4: Floating chronology for red spruce in the Barrington Meeting House.

The beams from this church effectively contribute to the two of the project's objectives which are to increase red spruce sample depth in Nova Scotia and to create a master chronology specific to southwestern Nova Scotia (Figure 5). All beams crossdate into the master chronology with a significance ranging from 0.333-0.715 (99% confidence of significance at 0. 3281). Out of the twelve samples used in the chronology, all achieve 99% significance or higher, with correlations to the live chronology above 0.3281.

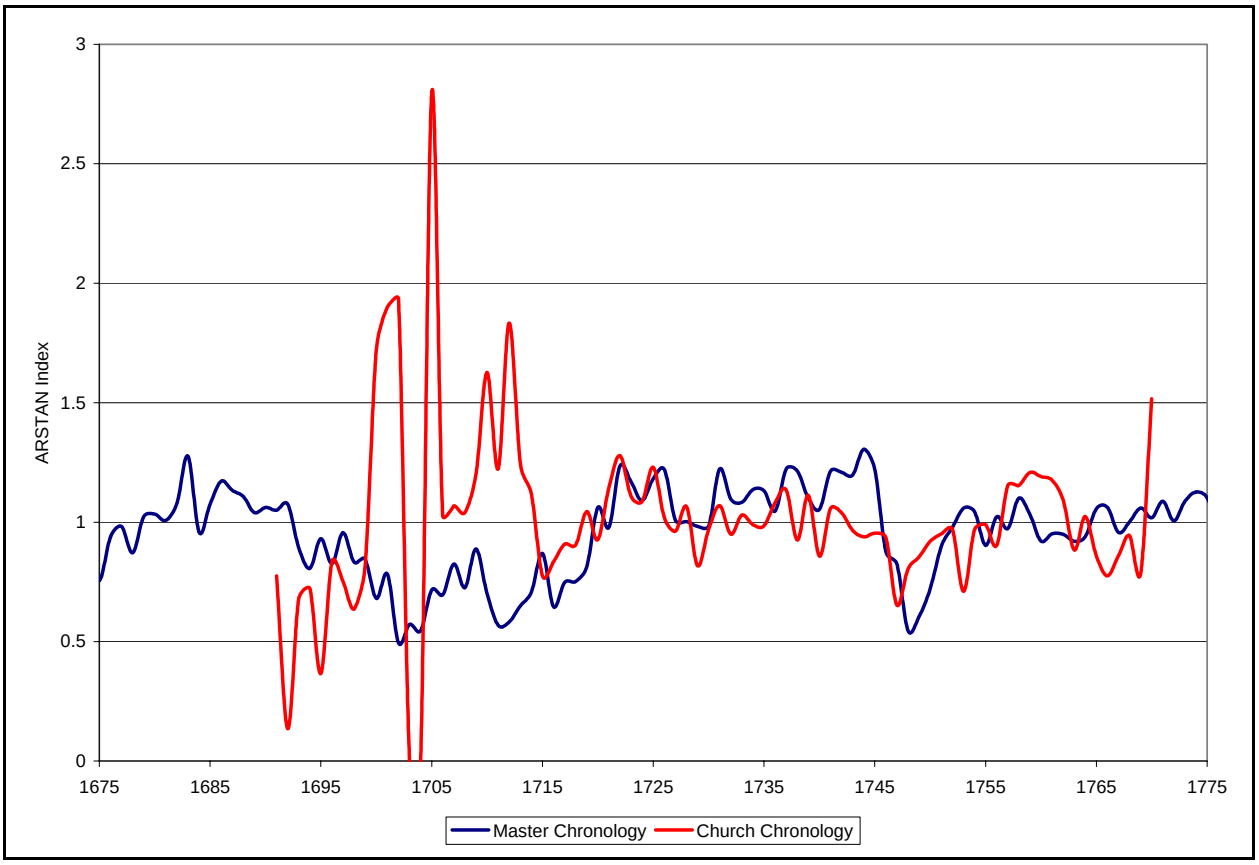


Figure 5: Overlap of the master and church chronologies shows similar growth patterns.

From this it was possible to develop a master chronology for red spruces in New Brunswick and southwestern Nova Scotia (Figure 6). The overall correlation of this chronology is 0.498, which is much higher than the 0.3281 required for 99% confidence of significance.

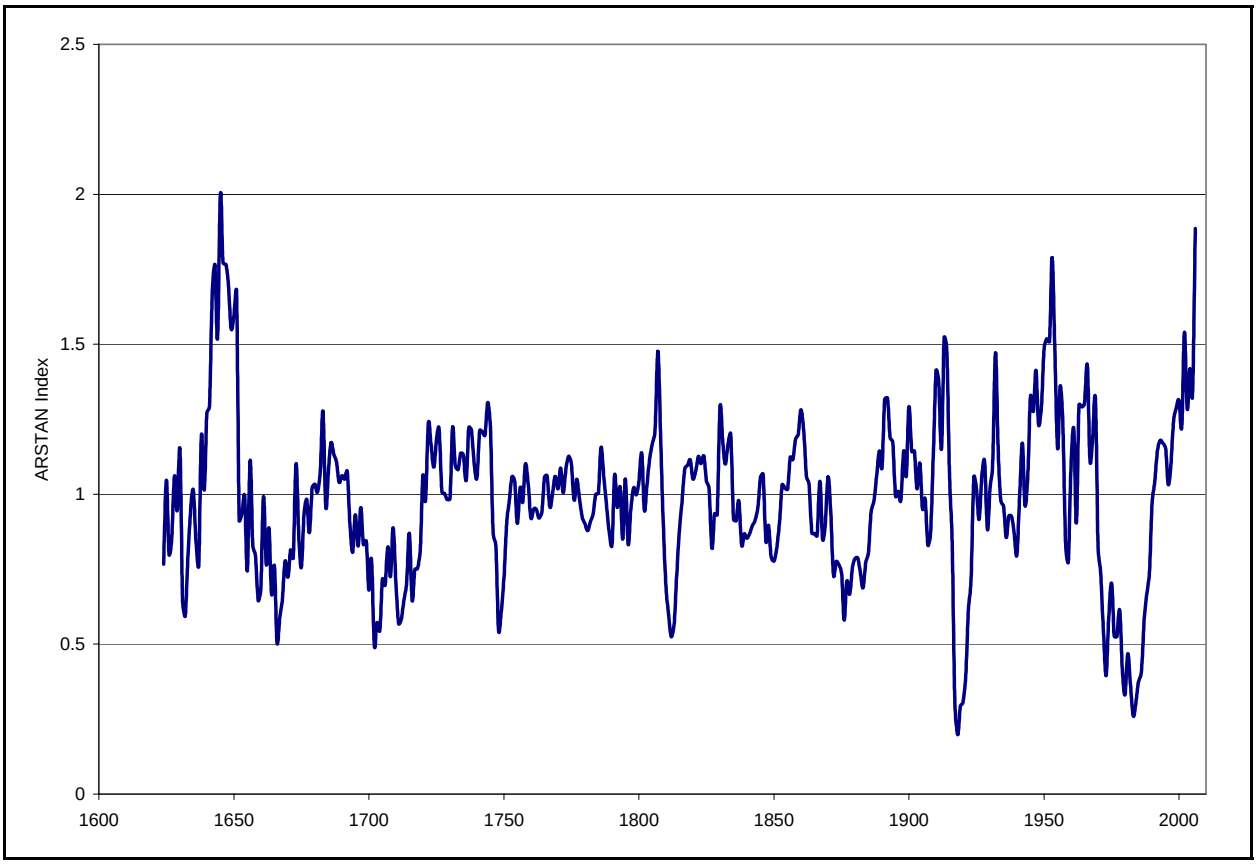


Figure 6: Combined master chronology for red spruce in New Brunswick and southwestern Nova Scotia.

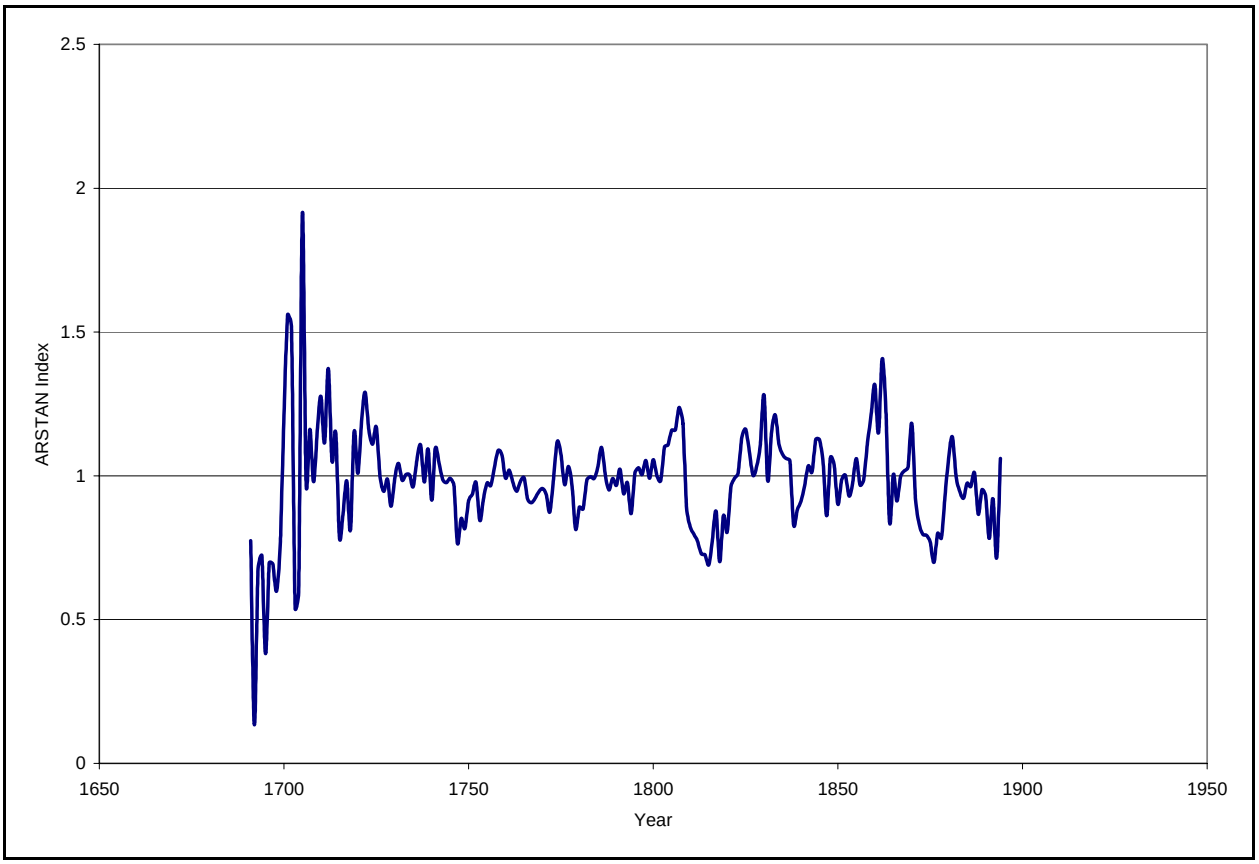


Figure 7: Master chronology for red spruces in southwestern Nova Scotia.

Conclusion

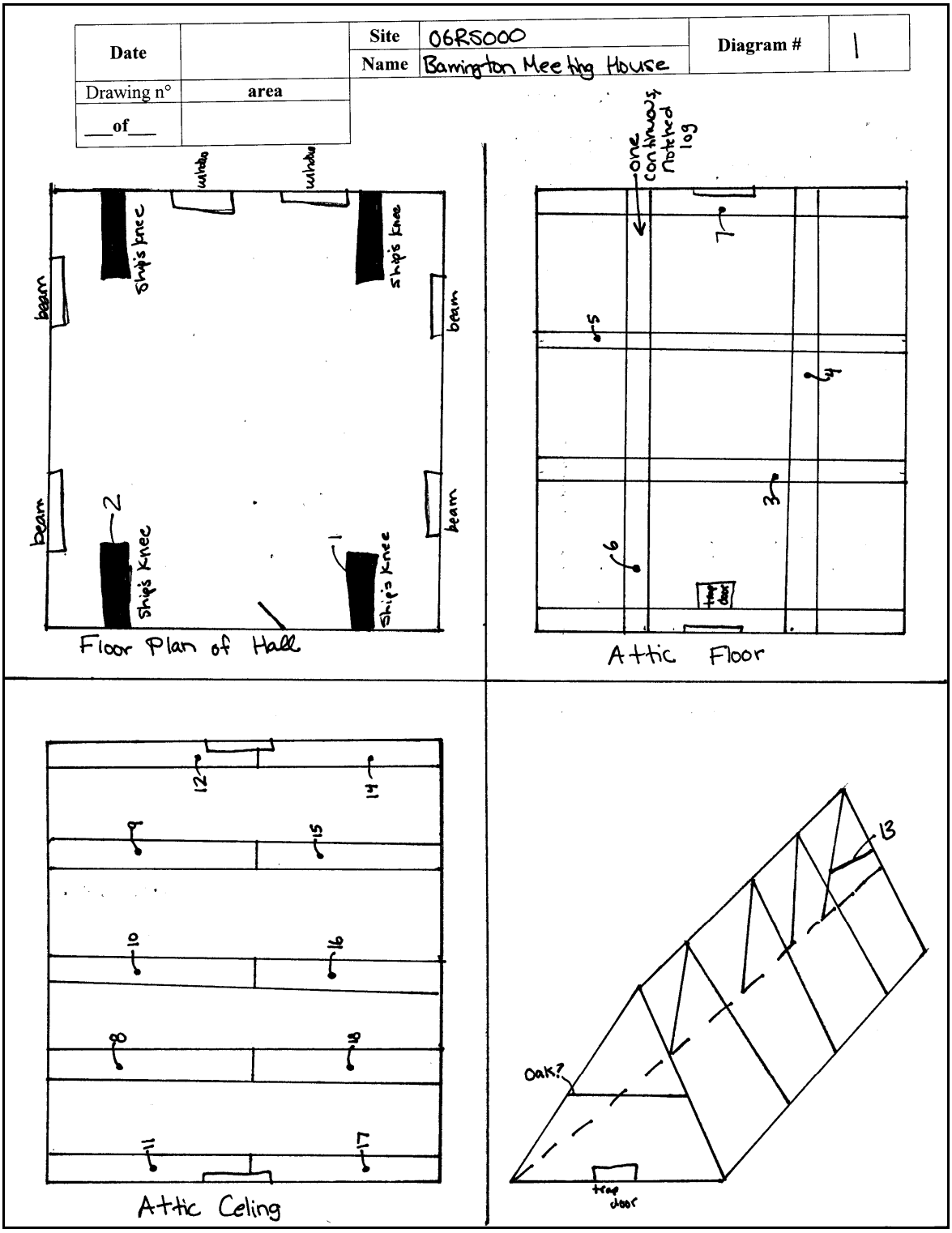
The master chronology for red spruce in southwestern Nova Scotia will have a number of uses. If red spruce samples from another structure in the region are found, it will be possible to place them in this chronology and thus determine the construction date of the structure. As well, this chronology can be used to learn about climatic trends in the past, enabling us both to have a better understanding about past climates and to compare these trends to the current Atlantic climate.

We found that the wood in the this church dated to the end of the growing season of 1763-1764 and this means that the construction date of the church of 1765 given by the parish records, is confirmed.

Works Cited

Duffus, Allan, Edward MacFarlane, Elizabeth Pacey and George Rogers. 1982. Thy Dwellings Fair: Churches of Nova Scotia 1750-1830. Hantsport: Lancelot Press.

Appendix



Appendix A: Diagram of Barrington Meeting House Attic.