Mount Allison
Dendrochronology Lab

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A Dendroarcheological Analysis of Old Meeting House: Port Medway, Nova Scotia

By

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Abstract

Sixteen tree-ring samples were taken from beams in the Old Meeting House in Port Medway, 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 white pine (*Pinus strobus*) 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 1831, supporting the records that the church was built in 1832.

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 Old Meeting House in Port Medway, Nova Scotia (MAD Lab #06LS000) was one of the eight churches the Mount Allison Dendrochronology (MAD) Lab sampled in the summer of 2006 (Figure 1). According to church records, the church was constructed in 1832. 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 church's parishioners, sampling was conducted.

Figure 1: The Old Meeting House, Port Medway, N.S.

Research Methods

Samples were taken from a total of sixteen 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 church's attic, where they have not been altered since the initial construction of the church. 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. Three

samples were examined using a scanning electron microscope (SEM) to identify the species within the sample set. Two samples were confirmed as to be white pine (*Pinus strobus*), and one sample was confirmed to be eastern white cedar (*Thuja occidentalis*). Knowing this, it was possible to determine that seven samples were white pine and nine were eastern white cedar.

The process of analyzing archeological data requires two steps, per species. 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 that were white pine were crossdated into a white pine master chronology constructed by the MAD Lab from live trees obtained from the Tobeatic Wilderness Area, Nova Scotia sampled in the summer of 2006. It was not possible to crossdate the eastern white cedar samples because there is not currently a master chronology for the species within southwestern 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 1831 (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 1831, approximately a year 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. This fact confirms the parishioners' records of the Old Meeting House being constructed in 1832.

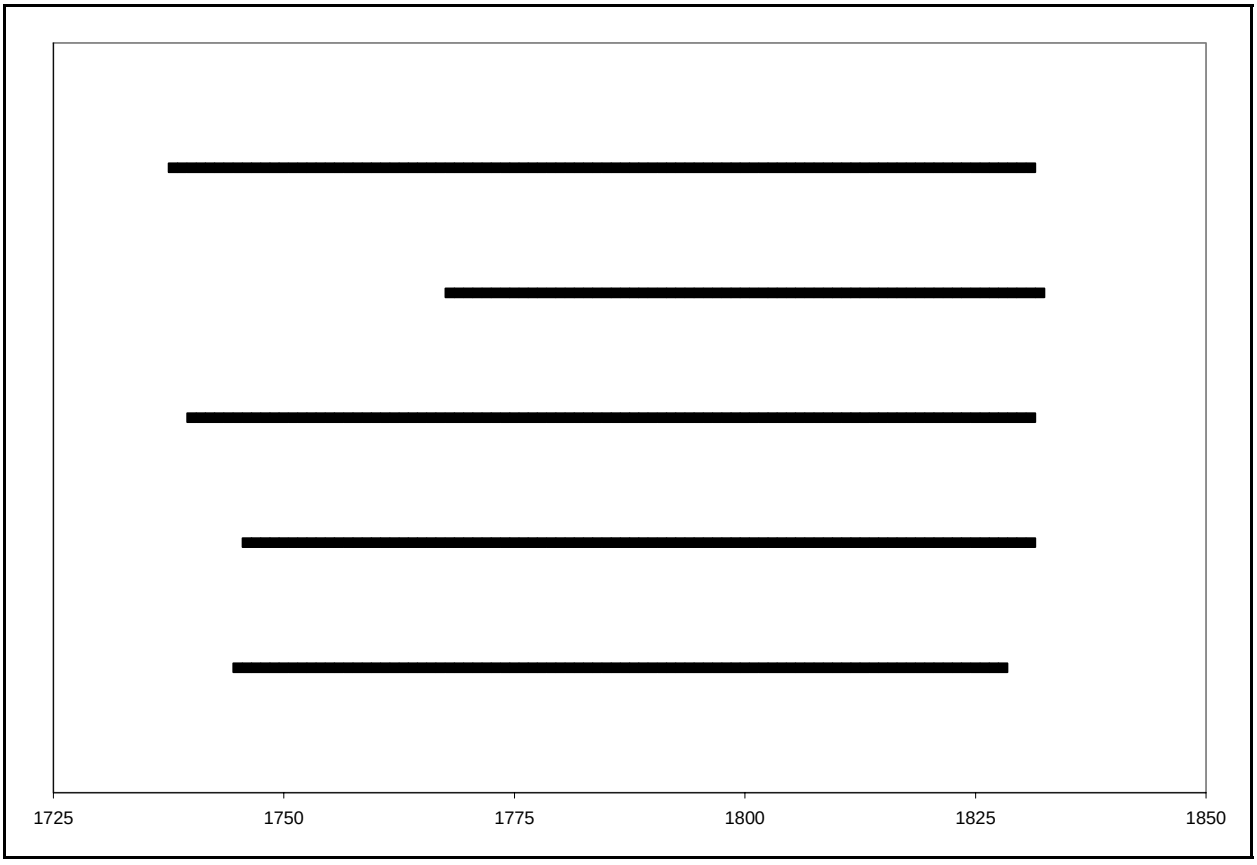


Figure 3: Life-spans of trees within beams of the Old Meeting House.

Sample Number	*Location*	*Bark Condition*	*Species*	*Crossdated Interval*
06LS001	attic	bark present	White pine	1745-1828
06LS003	attic	bark present	White pine	1746-1831
06LS004	attic	bark present	White pine	1740-1831
06LS005	attic	no bark present	Eastern white cedar	
06LS006	attic	bark present	White pine	1768-1832
06LS007	attic	no bark present	White pine	1738-1831
06LS009	attic	bark present	Eastern white cedar	
06LS010	attic	bark present	Eastern white cedar	
06LS011	attic	bark present	Eastern white cedar	
06LS012	attic	bark present	Eastern white cedar	
06LS013	attic	no bark present	Eastern white	

			cedar	
06LS014	attic	no bark present	Eastern white cedar	
06LS015	attic	no bark present	Eastern white cedar	
06LS016	attic	bark present	Eastern white cedar	

Table 1: Data on samples collected from beams within the Old 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 white pine samples within the beams of the church.

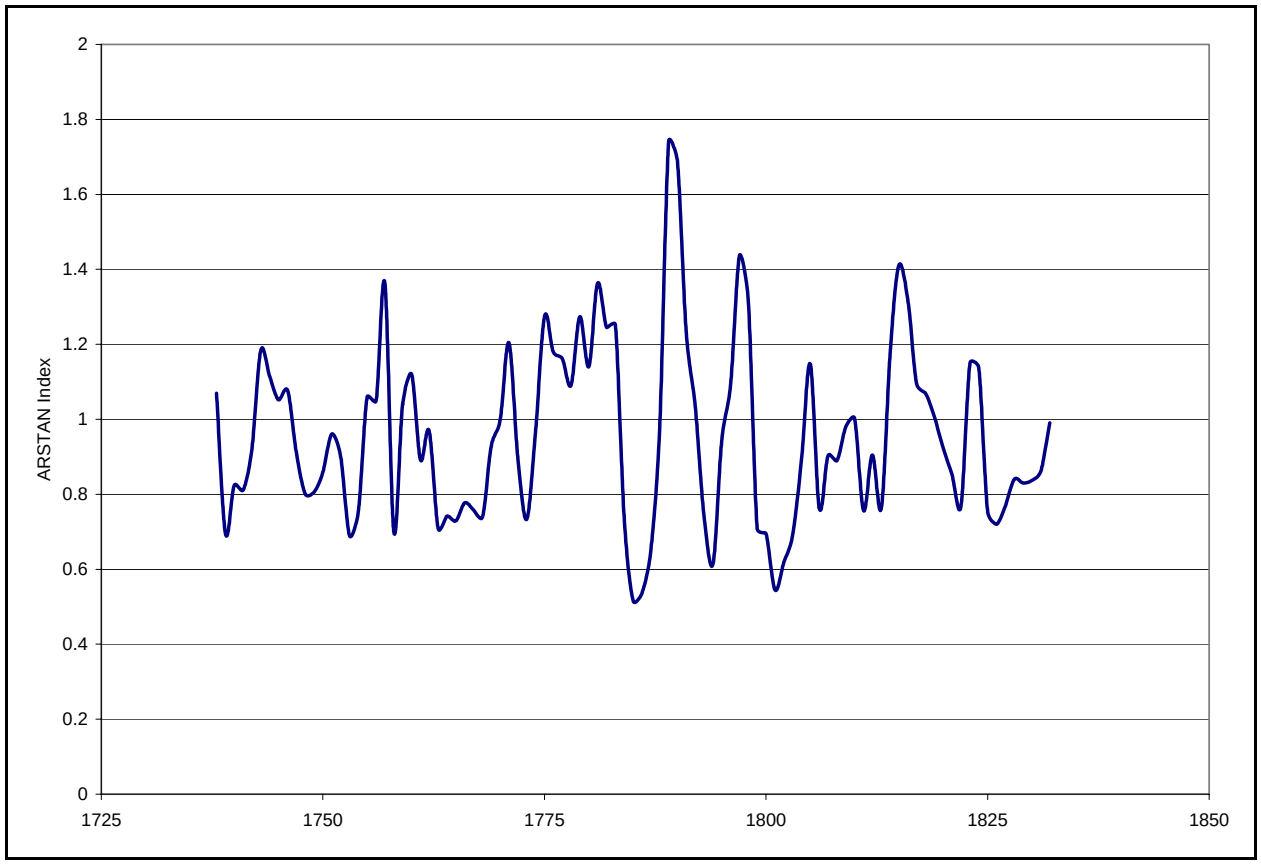


Figure 4: Floating chronology for white pine in the Old Meeting House.

The beams from this church effectively contribute to the two of the project's objectives which are to increase white pine sample depth in Nova Scotia and to create a master chronology specific to southwestern Nova Scotia (Figure 6). All beams crossdate into the live chronology with a significance ranging from 0.118-0.317 (90% confidence of significance at 0. 21). Out of the five white pine samples, three achieve 90% significance or higher, with correlations to the

live chronology above 0.21. The reason that the significance levels are not higher than 90% may be due to the different habitats the live stand and the church "stand" grew in. The live stand is from the Tobeatic Wilderness Area in the interior of southwestern Nova Scotia. According to church records, the trees from the Old Meeting House grew in Port Medway, which is much closer to the coast. Thus, the trees likely experienced quite different growing conditions, making it difficult to compare them to each other.

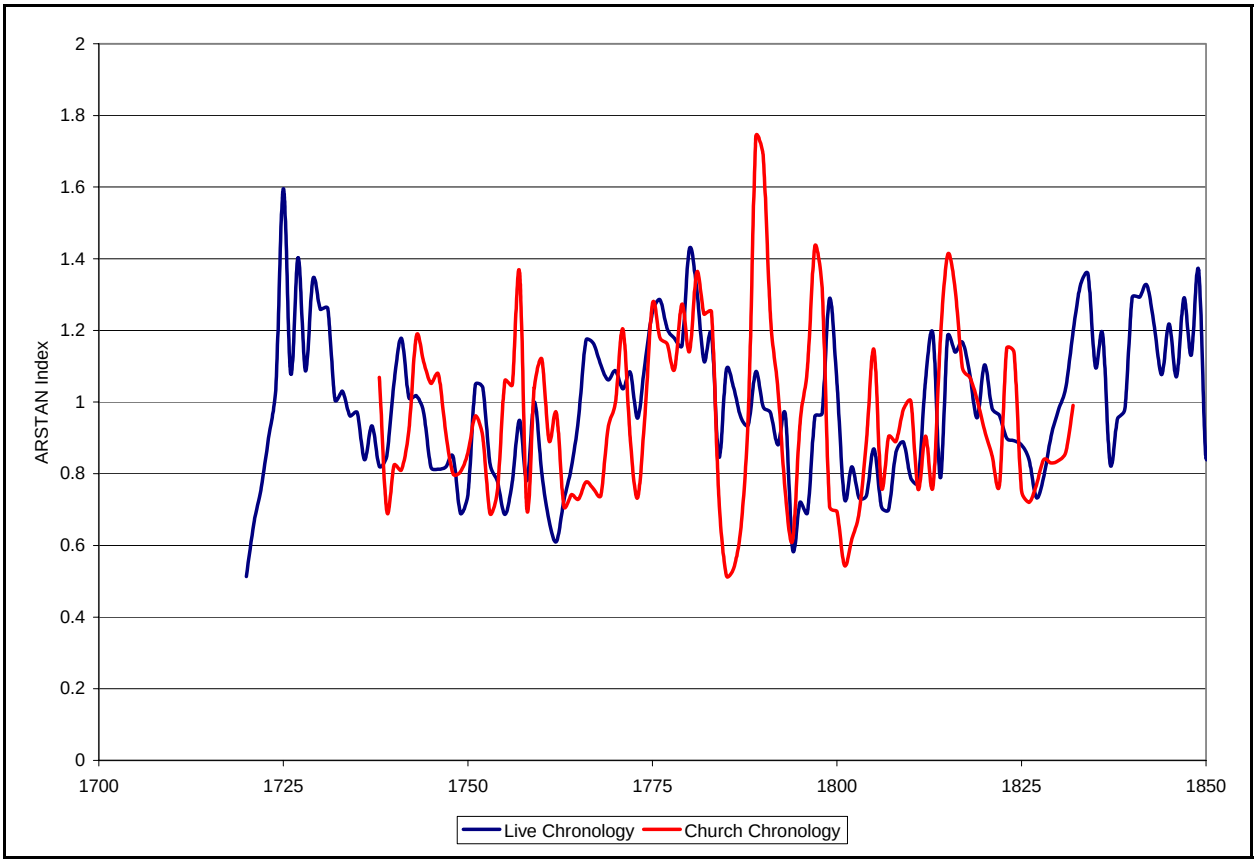


Figure 5: Overlap of the living and church chronologies shows similar growth patterns.

From this it was possible to develop a master chronology for white pines in southwestern Nova Scotia (Figure 6). The overall correlation of this chronology is 0.468, which is much higher than the 0.3281 required for 99% confidence of significance.

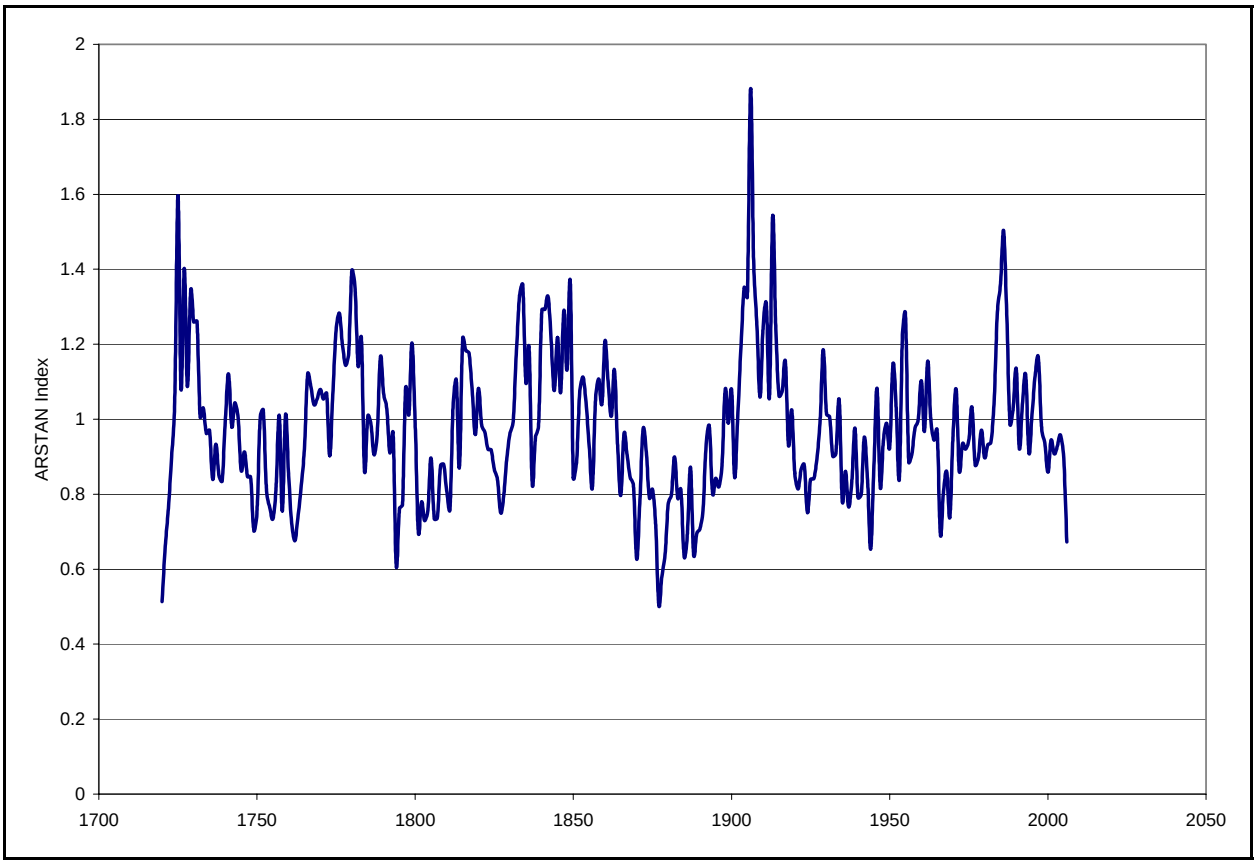


Figure 6: Master chronology for white pines in southwestern Nova Scotia.

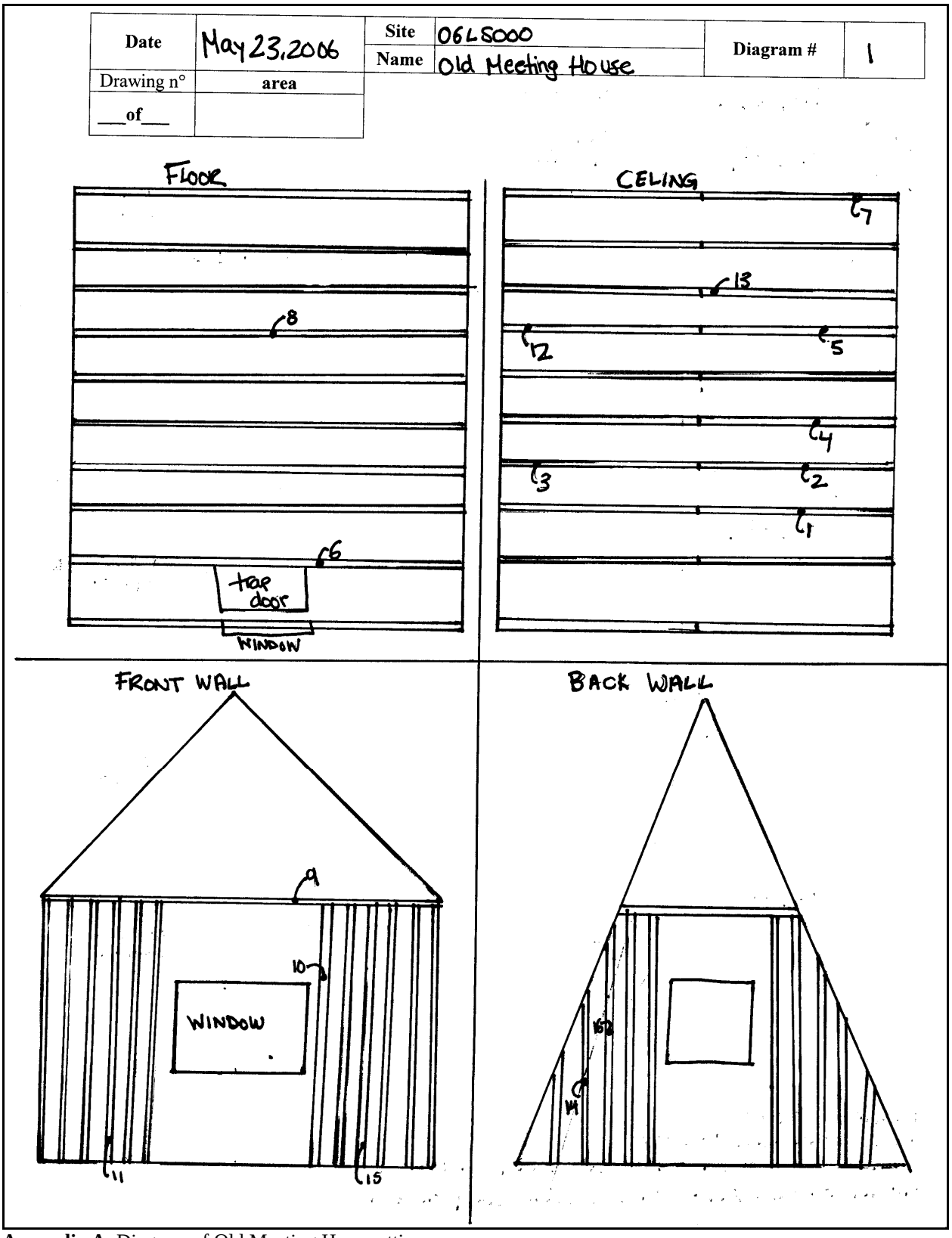
Although the eastern white cedar samples cannot be crossdated at this time, they hold valuable information about growth patterns of the species in southwestern Nova Scotia. The species is currently endangered within the province; therefore being able to provide past growth signals may be important in the study of the species' future habitat.

Conclusion

The master chronology for white pine in southwestern Nova Scotia will have a number of uses. If white pine 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 1831 and this means that the construction date of the church of 1832 given by the parish records, is confirmed.

Appendix



Appendix A: Diagram of Old Meeting House attic.