A Dendrochronological Analysis of the "Rysdorph House", Wynantskill, Rensselaer County, New York.

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Introduction

This is the final report on the dendrochronological analysis of the "Rysdorph House", 157 Mammoth Spring Road, Wynantskill, Rensselaer County, New York 12198 (42°38'32"N 73°38'54"W). The house and grounds are owned by Lloyd & Linda Miller, who wish to chronicle the historical evolution of the property. In an effort to establish a more precise history of the buildings, architectural historian Wally Wheeler, Rensselaer NY, at the behest of the Millers requested that dendrochronologists William Callahan and Dr. Edward Cook perform a tree-ring analysis of selected, representative structural timbers from the structure.

Callahan visited the site and collected samples for the dendrochronological analysis of the timbers on 18 February 2020. Of the 12 field samples taken, 11 were deemed methodologically and conditionally of sufficient quality for submission for laboratory analysis. One sample was discarded on site immediately after extraction, due to deficient physical quality and/or insufficient number of rings. Nine of the submitted samples were of pitch pine (*Pinus rigida*) and two were of white pine (*Pinus strobus*). One of the 9 submitted pitch pine samples (RHRCNY 11), a floor board *ex situ*, eventually provided two measured radii to the analysis (see Table 1).

Every effort was made on site to locate bark or waney edges on the sampled timbers in order to ascertain the absolute cutting date, or dates, of the trees used in the construction. After this analysis, the core samples and their associated measurement series will be permanently archived at the Tree Ring Research Laboratory, Lamont-Doherty Earth Observatory, Columbia University, under the sample reference numbers listed in Table 1, column 1.

Dendrochronological Analysis

Dendrochronology is the science of analyzing and dating annual growth rings in trees. Its first significant application was in the dating of ancient Indian pueblos of the southwestern United States (Douglass 1921, 1929). Andrew E. Douglass is considered the “father” of dendrochronology, and his numerous early publications concentrated on the application of tree-ring data to archaeological dating. Douglass established the connection between annual ring width variability and annual climate variability which allows for the precise dating of wood material (Douglass 1909, 1920, 1928; Stokes and Smiley 1968; Fritts 1976; Cook and Kariukstis 1990). The dendrochronological methods first developed by Douglass have evolved and been employed throughout North America, Europe, and much of the temperate forest zones of the globe (Edwards 1982; Holmes 1983; Stahle and Wolfman 1985; Cook and Callahan 1992, Krusic and Cook 2001). In Europe, where the dendrochronological dating of buildings and artifacts has long been a routine professional support activity, the success of tree-ring dating in historical contexts is noteworthy (Baillie 1982; Eckstein 1978; Bartholin 1979; Eckstein 1984).

The wood samples collected from the Rysdorph House were processed in the tree-ring laboratory by Dr. Edward Cook following well-established dendrochronological methods. The cored samples were carefully glued onto grooved mounts and were sanded to a high polish to reveal the annual tree rings clearly. The rings widths were measured under a microscope to a precision of ±0.001 mm. The cross-dating of the obtained measurements utilized the COFECHA computer program (Holmes), which employs a sliding correlation to identify probable cross-dates between tree-ring series. In all cases, the robust non-parametric Spearman rank correlation coefficient was used for determining cross-dating. Experience has shown that for trees growing in the northeastern United States, this method of cross-dating is greatly superior to the traditional skeleton plot technique (Stokes and Smiley 1968), now disused. It is also very similar to the highly successful CROS program employed by, for instance, Irish dendrochronologists to cross-date European tree-ring series (Baillie).

COFECHA is used to first establish internal, or relative, cross-dating amongst the individual timbers from the site itself. This step is critically important because it locks in the relative positions of the timbers to each other, and indicates whether or not the dates of those specimens with outer bark rings are consistent. Subsequently, one or more internally cross-dated series are compiled from the individual site samples, and these are compared in turn with independently established tree-ring master chronologies compiled from living trees and dated historical tree-ring material. All of the regional "master chronologies" are based on completely independent tree-ring samples.

During the Rysdorph House study, species specific, regional composite master chronologies from living trees and historical structures from the Hudson Valley and Central New York state and other near-lying regions were referenced primarily. All dating results were verified finally by subsequent comparison with other independent dating masters from surrounding regions. In each case, the datings as reported here were confirmed as correct.

Results and Conclusions

The results of the dendrochronological dating of the Rysdorph House timbers are summarized in **Table 1** and **Figure 1**. A total of 11 samples were analyzed in the laboratory, with six of the samples providing seven firm dendrochronological dates: one these six dated samples, an *ex situ* floor board from a split and planed timber, provided two directionally different measured radii (RHRCNY11a&b) originating from the pith of the tree. All of the dated samples were of pitch pine. Neither of the white pine samples could be dated.

To achieve these datings required attention during analysis to the previously recorded structural context of the samples (see **Table 1**, column 3). The contextual association of samples from within the structure(s), the redundancy of the indicated relative cross-datings, and the eventual existence of bark/waney edges demonstrating cutting year, provides the essential constraints necessary for establishing cross-dating, both within a site and with absolute chronological masters.

The strength of the cross-dating of the samples is indicated by the Spearman rank correlations in the seventh column ("CORREL") of **Table 1**. These statistical correlations, produced by the COFECHA program, indicate how well each sample cross-dates with the mean of the others in the group. The individual correlations vary slightly in statistical strength, but all are in the range that is expected for correctly cross-dated timbers from buildings in the eastern United States.

The outermost ring on a waney, bark-edged sample identifies the absolute cutting year. Absence of the bark edge (interchangeably called the wane) on a sample indicates that the outermost extant ring is not the year of cutting, but some identifiable year preceding the cutting. In the absence or loss of wane, field observations of wood anatomical factors often permit close approximation of the number of missing rings and thus estimation of the cutting date. In particular the presence of sapwood, a physiologically active wood found immediately within the bark on the outer portion of the trunk, is an indication that the original wane was near.

Of the six pine samples from the Rysdorph House that cross-dated well between themselves and also dated well against the local historical dating master (see **Table 1**, column 6), four (RHRCNY01, 02, 03, 04) had field verified bark edge at the start of sampling that was lost during the extraction process due to surface degradation. Field observations of these four lost wanes included an evaluation of the number of rings presumably lost, providing evidence that allowed for a reasoned approximation of the actual cutting date for the timbers and thus a date of the structural unit as a whole.

The outermost fully extant ring on any of the analyzed pine samples is from 1751; the pines employed in the construction thus were harvested in or more likely after calendar year 1752. Given field observations of the degree of ring loss that occurred during extraction, harvesting very likely took place during a period some 3 to 10 years after the date of the outermost extant ring on the four samples mentioned above. Initial usage of the these materials took place not long after harvesting, for *in situ* inspection of the timbers indicated that most if not all were worked soon after cutting, activity in keeping with historical woodworking and carpentry techniques. It is a far easier task to work freshly cut timbers, and subsequent drying and shrinkage tightens pinions, etc., strengthening the integrity of the structure.

The chronological congruency in this particular collective set of datings from the building supports reasoned speculation that a significant construction phase for the Rysdorph House, as it exists, took place no earlier than the laying down of the cellar pine timbers, one arguably completed during the mid- to late 1750's. When proposing a potential construction date, it must be remembered that timber harvesting may have occurred somewhat in advance of a planned construction, and also that final construction activities may possibly have continued for some few years after. Furthermore, re-use of older timbers in the construction of this building phase, although not evidenced directly in the sampled materials, cannot be excluded absolutely and must be considered when purporting the site's construction history. However, given the uniformity of the dating of the subject timbers, which were chosen after deliberate inspection for sampling as structurally representative, it is very likely that the dates are demonstrative of the history of this portion of the Rysdorph House structure.

Part of the project intent included also finding methodologically suitable samples from an attached section of the house that is typologically and stylistically interpreted as representing a belated construction phase some years subsequent to the 1752+ phase discussed above. Unfortunately this attempt was not successful to the degree necessary. Though four timbers were sampled in this section only one dating was achieved: two of the timbers (RHRCNY07 & 08) had too few rings to provide statistical certitude and were of a pine species (*strobus)* unlike the majority of samples (*rigida*) from the house, greatly weakening any potential for a site composite crossdating; two of the timbers (RHRCNY09 &10) were kitchen joists of the majority pine species but which were so heavily woodworked to meet their desired function and aesthetics that very few rings and no wane edge remained.

One of these two kitchen joists could nevertheless be dated, with an outermost extant ring of 1746. That this year is proximate to those of the cellar timbers is likely coincidence, and should not be interpreted as empirical concurrence. Close examination of the joists revealed that their dimensions had been so reduced during preparation that it is reasonable to assume that the timbers originally contained many more rings than at present. It is not unreasonable to speculate that as many as several decades now may be missing from the outer portions of the squared logs.

Two attic rafters (RHRCNY05 & 06) could not either be dated, in spite of ring numbers generally methodologically sufficient for success. Probably branch-wood, these timbers exhibited such extremely compressed growth as to be nearly unmeasureable. Additionally, the compressed condition of the rings exacerbated a tendency common in *Pinus rigida* to growth suppression, i.e. to fail occasionally when under stress to produce any ring growth. Despite repeated attempts, including multiple re-measurements, it was impossible to determine how many or within which segments rings were or might be missing. Therefore no results could be derived that were scientifically viable and dendrochronologically justified for release.

Table 1. Dendrochronological dating results for pine samples from the "Rysdorph House", Wynantskill, Rensselaer County, New York. All correlations are Spearman rank correlations of each series against the mean of all of the others of the same species. For WANEY, +BE means the bark edge ring was present and thought to be recovered at the time of sampling; -BE means that the bark edge was not recovered or was completely missing on the timber. If –BE, +SP refers to the strong likelihood that sapwood rings are present; if so, the outermost date will be close to the cutting date. If the outermost recovered +BE ring is completely formed, it is indicated as "Comp", meaning that the tree was felled in the dormant season following that last year of growth. "Inc" means that the outermost ring was not fully formed, meaning that the tree was felled during the spring/summer growing season of the indicated calendar year.

PRIMARY SAMPLING, TAKEN FROM THE RYSDORPH HOUSE						
ID	**SPECIES**	**DESCRIPTION**	**WANEY**	**RINGS**	**DATING**	**CORREL**
RHRCNY01	Pitch Pine	East/west beam, south cellar, 3rd from south wall	-BE, BE+ at start, outer portion lost	101	1651-**1751**	0.605
RHRCNY02	Pitch Pine	North/south cradle timber, south cellar, northeast side cradle	-BE, BE+ at start, outer portion lost	86	1646-1731	0.488
RHRCNY03	Pitch Pine	East/west beam, south cellar, 2nd from south wall	-BE, BE+ at start, outer portion lost	50	1638-1687	0.488
RHRCNY04	Pitch Pine	Sill, over wall between north & south cellar sections	-BE, BE+ at start, outer portion lost	104	1644-1747	0.424
RHRCNY05	Pitch Pine	Attic, south end, west side, rafter, 7th from south wall	+BE	72	No Date **	-.---
RHRCNY06	Pitch Pine	Attic, south end, west side, rafter, 10th from south wall	+BE	96	No Date **	-.---
RHRCNY07	White Pine ‡‡	Southeast bathroom, 2nd floor (assumed 2nd phase), joist, 3rd from south wall	+BE	48	No Date, too few rings	-.---
RHRCNY08	White Pine ‡‡	Hallway, 2nd floor (assumed 2nd phase), beam	+BE?	52	No Date, too few rings	-.---
RHRCNY09	Pitch Pine	Old Kitchen, 1st floor (assumed 2nd phase), joist, 2nd from fireplace	-BE, heavily squared	60	1687-1746	0.401
RHRCNY10	Pitch Pine	Old Kitchen, 1st floor (assumed 2nd phase), joist, 1st above fireplace	-BE, squared	68	No Date	-.---
RHRCNY11a	Pitch Pine	Floor board, radius #1, 1st floor bathroom, assumed phase 1, *ex situ*	-BE planed board	126	1575-1700	0.576
RHRCNY11b	Pitch Pine	Floor board, radius #2, 1st floor bathroom, assumed phase 1, *ex situ*	-BE planed board	86	1575-1660	0.515

**** severe outer ring suppression, likely missing rings**
‡‡ different pine species (Pinus strobus), with complacent ring series and with too few rings to date-

Table 1. Dendrochronological dating results for pitch and white pine samples taken from the Rysdorph House located in Wynantskill, Rensselaer County, New York. For interpreted felling dates of the trees used for construction, +BE means that the bark edge was present and believed to be recovered at the time of sampling; -BE means that the bark edge was not recovered or was completely missing on the timber. If –BE, +SP refers to the strong likelihood that sapwood rings are present; if so, the outer date may be close to the cutting date. All correlations are Spearman rank correlations of each series

The "r-factor" is the Spearman rank correlation coefficient, a measure of relative statistical agreement between two groups of measurements or data. It can range from +1 (perfect direct agreement) to -1 (perfect opposite agreement). The "t-value" is Student's distribution test for determining the unique probability distribution for "r", i.e. the statistical likelihood of its agreement value occurring by chance alone. As a rule, a t=3.5 has a probability of about 1 in 1000, or 0.001, of being invalid. Higher "t" values indicate exponentially increasing, stronger statistical certitude.

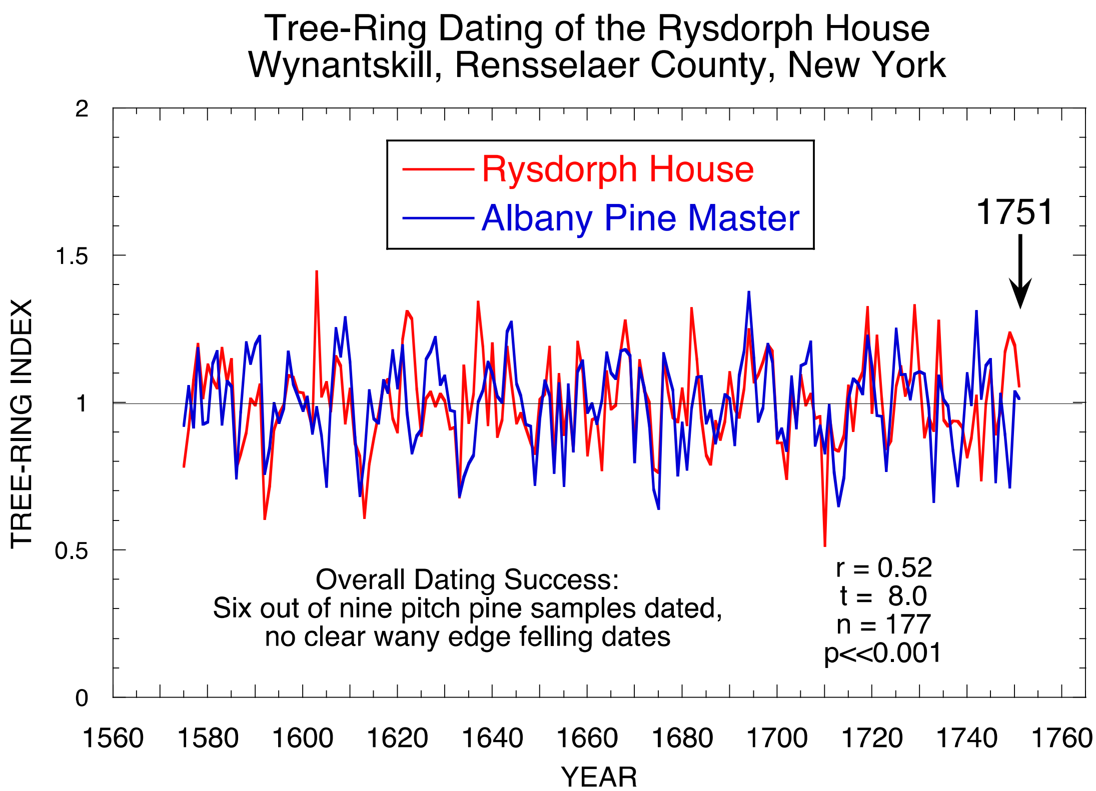
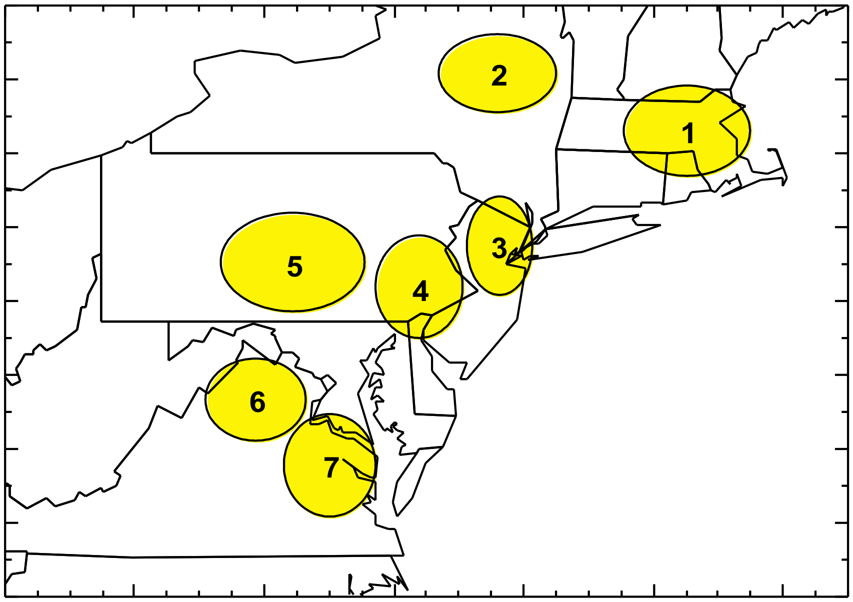


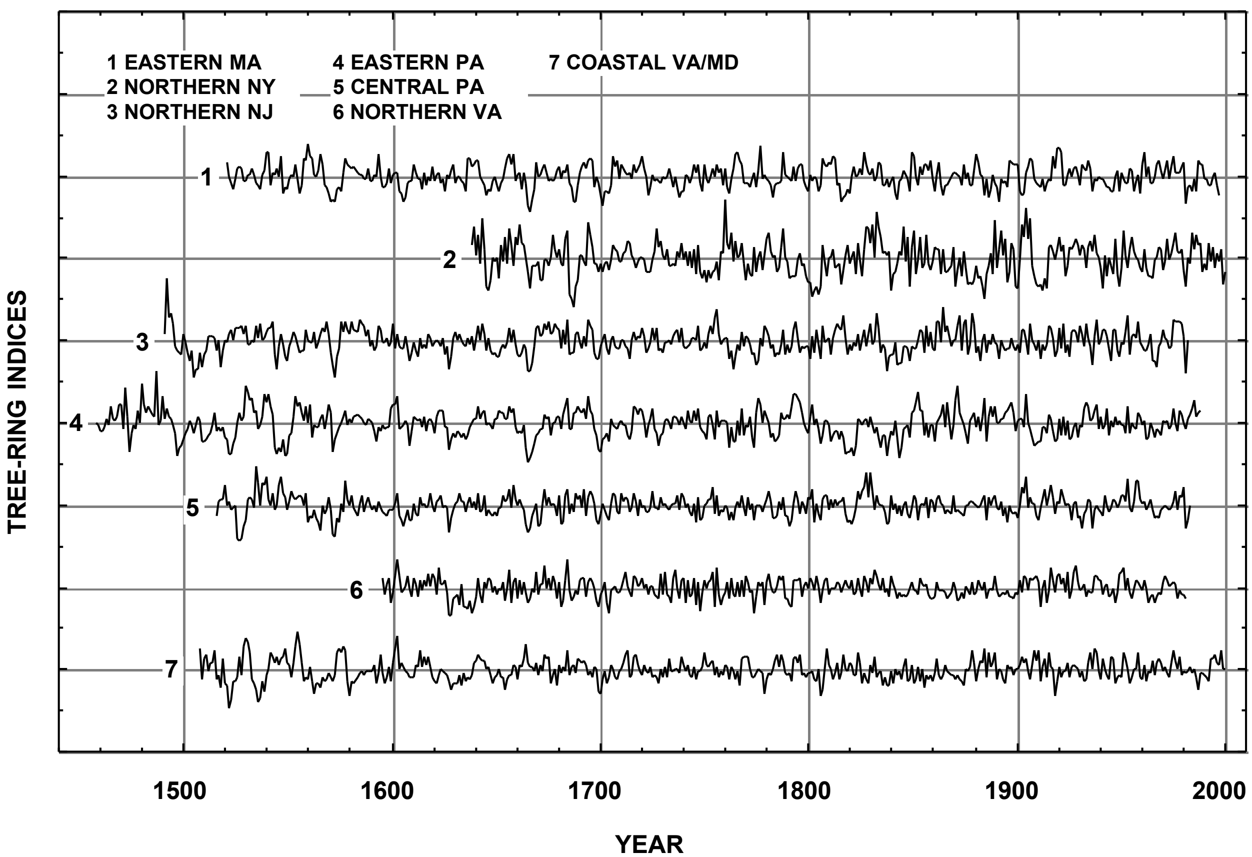
Figure 1. Comparison of the cross-dated, site compiled pitch pine site chronology for the Rysdorph House against a historical pine master chronology from Central New York state. Six of the eleven tested samples dated, with one of the six providing an outermost ring date of 1751 and with three other structurally associated samples within a similar chronological range. Only one sample could be dated from a purported second phase building expansion. The Spearman rank correlation between the series (r=0.52) is highly significant ($p<0.001$) with an overlap of 177 years and a t-statistic of 8.0.

The t-statistics (t=8.0) associated with the correlation between the Rysdorph House pine series and the regional pine master chronology (r=0.52) is statistically very significant ($p<<0.001$) for a 177-year overlap. For that reason, there can be no doubt that the dates presented here for the sampled elements of that structure are robustly valid, and that the statistical chance of the cross-dates being incorrect is exponentially far less than 1 in 1000.

MODERN/HISTORICAL OAK CHRONOLOGIES
REGIONAL LOCATIONS OF SAMPLES



MODERN/HISTORICAL OAK TREE-RING CHRONLOGIES



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Edward Cook was born in Trenton, New Jersey, in 1948. He received his PhD. from the Tucson Tree-Ring Laboratory of the University of Arizona in 1985, and has worked as a dendrochronologist since 1973. Currently director of the Tree-Ring Laboratory at the Lamont-Doherty Earth Observatory of Columbia University, he has comprehensive expertise in designing and programming statistical systems for tree-ring studies, and is the author of many works dealing with the various scientific applications of the dendrochronological method.

William Callahan was born in West Chester, Pennsylvania, in 1952. After completing his military service he moved to Europe, receiving his MA from the University of Stockholm in 1979. He began working as a dendrochronologist in Sweden in 1980 at the Wood Anatomy Laboratory at the University of Lund, and returned to the United States in 1998. A former research associate of Dr. Edward Cook at the Tree-Ring Laboratory of Lamont-Doherty, he has extensive experience in using dendrochronology in dating archaeological artifacts and historic sites and structures.

Some regional historical dendrochronological projects completed by the authors:

Abraham Hasbrouck House, New Paltz, NY
Allen House, Shrewsbury, NJ
Belle Isle, Lancaster County, VA
Bowne House, Queens, NY
Carpenter's Hall, Philadelphia, PA
Charpentier House, Philadelphia PA
Christ's Church, Philadelphia, PA
Clifton, Northumberland County, VA
Conklin House, Huntington, NY
Customs House, Boston, MA
Daniel Boone Homestead, Birdsboro, PA
Daniel Pieter Winne House, Bethlehem, NY
Ditchley, Northumberland County, VA
Ephrata Cloisters, Lancaster County, PA
Fallsington Log House, Bucks County, PA
Ferris House, Old Greenwich, Fairfield County, CT
Fawcett House, Alexandria, VA
Gadsby's Tavern, Alexandria, VA
Garrett House, Sugartown PA
Gilmore Cabin, Montpelier, Montpelier Station, VA
Gracie Mansion (Mayor's Residence), New York, NY
Grove Mount, Richmond County, VA
Hanover Tavern, Hanover Courthouse, VA
Harriton House, Bryn Mawr, PA
Hills Farm, Accomack County, VA
Hollingsworth House, Elk Landing, MD
Indian Banks, Richmond County, VA
Indian King Tavern, Haddonfield NJ
Independence Hall, Philadelphia, PA
John Bowne House, Forest Hills, NY
Kirnan, Westmoreland County, VA
Linden Farm, Richmond County, VA
Log Cabin, Fort Loudon, PA
Lower Swedish Log Cabin, Delaware County, PA
Lummis House, Ipswich MA
Marmion, King George County, VA
Martin Cabin, New Holland PA
Menokin, Richmond County, VA
Merchant's Hope Church, Prince George County, VA
Millbach House, Lebanon County, PA
Monaskon, Lancaster County, VA
Morris Jumel House, Jamaica, NY
Frederick Muhlenberg House, Trappe, PA
Nottingham DeWitt House, NY
Old Barn, Madison VA
Old Caln Meeting House, Thorndale, PA
Old Parsonage, Kinderhook NY
Old Swede's Church, Philadelphia, PA
OTB House, West Nyack, NY
Panel Paintings, National Gallery, Washington, DC
Pennock House & Barn, London Grove, PA
Penny Watson House, Greenwich, NJ
Podrum Farm, Limekiln, PA
Powell House, Philadelphia, PA
Pyne House, Cape May, NJ
Radcliff van Ostrade, Albany, NY
Reese's Corner House, Rock Hall, MD
Rippon Lodge, Prince William County, VA
Rochester House, Westmoreland County, VA
Rockett¨s, Doswell VA
Rural Plains, Hanover County, VA
Sabine Hall, Richmond County, VA
Shirley, Charles City County, VA
Sisk Cabin, Culpeper VA
Stiles Cabin, Sewickely PA
Spangler Hall, Bentonville, VA
Springwater Farm, Stockton, NJ
St. Peter's Church, Philadelphia, PA
Strawbridge Shrine, Westminster, MD
Sweeney-Miller House, Kingston, NY
Thomas & John Marshall House, Markham, VA
Thomas Grist Mill, Exton, PA
Thomas Thomas House, Newtown Square, PA
Ticonderoga Pavilion, Ticonderoga, NY
Tuckahoe, Goochland County, VA
Tullar House, Egremont MA
Updike Barn, Princeton, NJ
Varnum's HQ, Valley Forge, PA
Verville, Lancaster County, VA
West Camp House, Saugerties, NY
Westover, Charles City County, VA
White Plains House, King George, VA
Wilton, Westmoreland County, VA
Yew Hill, Fauquier County, VA