FINAL REPORT

THE YEAR OF CONSTRUCTION OF
SOLITUDE, DEPENDENCY, AS DERIVED BY
KEY-YEAR DENDROCHRONOLOGY

submitted by:

Herman J. Heikkenen, Ph.D.
Principal Investigator

Peter J. J. Egan, Ph.D.
President

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ABSTRACT

THE LAST YEAR OF TREE GROWTH FOR SELECTED TIMBERS
WITHIN SOLITUDE DEPENDENCY AS DERIVED
BY KEY-YEAR DENDROCHRONOLOGY*

This key-year dendrochronology study has established that selected structural members within Solitude Dependency were hewed and sawed from white oaks (Quercus spp.) that were felled after the growing seasons of 1841, 1842 and 1843.

The year of best fit for the oak key-year pattern was highly significant when aligned with the area oak key-year pattern for Southwestern Virginia.

* U. S. Patent No. 4,373,393
FINAL REPORT

THE LAST YEAR OF TREE GROWTH FOR SELECTED TIMBERS WITHIN SOLITUDE DEPENDENCY AS DERIVED BY KEY-YEAR DENDROCHRONOLOGY*

I. Introduction:

The interest expressed in Dendrochronology, Inc.'s key-year alignment technique to date the year of construction of Solitude Dependency has led to this study.

The key-year technique relates to a patented dendrochronological method for the study of annual growing seasons and tree species over an extended period of time. The key-year technique relates particularly well to a method of accurately determining the year of construction and authenticity of timbers within historic structures (Heikkenen 1984, Heikkenen and Edwards, 1984).

This study presents the alignment of the oak (Quercus spp) key-year pattern for selected timbers within Solitude Dependency and the corollary: the last year of tree growth of said timbers used in the construction of this historical structure.

*U.S. Patent No. 4,373,393
II. **DESCRIPTION OF AREA:**

Solitude is located in Montgomery County, Virginia. Within this study area is one predominant physiographic region – the southern Appalachian ridges and valleys. The geological materials are predominantly underlain in the valleys by limestone and shales on the ridges by sandstones and shales.

The major forest type is oak-hickory with common associates including southern yellow pine, tulip-poplar and gum. Although the composition of tree species within a given forest stand varies widely with soils and past land use, the oaks are the most widely distributed hardwood; pure stands of Virginia pine also occur.

The annual precipitation ranges from 41 to 45 inches per year; the soils usually return to field capacity during the winter, and the annual potential evapotranspiration throughout the study area ranges between 22 and 28 inches. The area is well known for occasionally extreme moisture deficits and excesses.

III. **AREA KEY-YEAR PATTERN:**

The development of the area’s tree-ring pattern for a given tree genera (oak, tulip-poplar and pine) is a computerized analysis of the number of trees from a given site expressing relative growth differences in a given year, especially the key years in which a significant number of the trees coincide regarding relative growth. The development of the area key-year patterns has been achieved by non-parametrical testing (Chi-square and Kappa) for the year of best fit for the key-year patterns from currently living trees and structures.

The area oak key-year pattern (SWVZ7, p = .05) was used to align the tree-ring patterns for Solitude Dependency. The timbers used in the construction of this historic structure were dated using the key-year technique (Heikkenen 1984; Heikkenen and Edwards, 1984 and McCrea, 1995).
IV. DESCRIPTION OF SOLITUDE DEPENDENCY:

Solitude Dependency is a small, one story log cabin, approximately 14’ x 16’. The cabin was originally sided.

V. SAMPLING PROCEDURES:

The dating of the logs from Solitude Dependency is based on wood samples removed by sawing. The sampling did not impair either the structural strength or the historic character of the logs.

A total of 14 samples were sawed on November 9, 1999, from logs removed in the reconstruction, and “in situ.” They were, as follows: walls – 7; joists – 4; plates – 2; and 1 - sill.

VI. TREE-RING ANALYSES:

The analyses of the disks involved the laboratory preparation of these samples by stabilizing, slicing to expose the transverse surface of the vessels, measuring each Figure 1. Solitude Dependency, November, annual ring of each sample, and presenting the data in a form suitable for computerized analyses.

The measurement of the widths of the annual rings was done with a dendrochronometer developed by Dendrochronology, Inc. This machine has a moveable stage (24” linear displacement) on which each wood sample was placed. The stage is hand moved, either forward or reverse (accuracy .01 mm). The prepared wood specimens were examined under binocular magnification (variable, 10-40X) under direct or transmitted light. When the width of an annual ring has been traversed, the distance is concomitantly measured and entered into the computer data bank. This dendrochronometer is unique regarding linear displacement, variable magnification, and lighting. The automatic recording of the data eliminated human error regarding the transfer of data and the year of occurrence of a given tree ring.
VII. **DERIVING THE KEY-YEAR PATTERN:**

The dating of the Solitude Dependency is based on the oak key-year (KY) pattern derived from wood samples taken from logs removed and logs in place on November 9, 1999. This oak KY pattern (SDS3) with \( n = 9 \) and at a probability level of \( p = .05 \) has a total of 37 KY (18 + KY and 19 – KY) and a length of 103 years.

VIII. **DATING SOLITUDE DEPENDENCY:**

The oak KY pattern for Solitude Dependency (SDS3, \( n = 9 \), \( p = .05 \)) was aligned with the area oak KY pattern (SWVZ7, \( p = .05 \)), year by year, from the present back to 1700. The year of best fit was 1843, having highly significant Chi-square and Kappa values (\( X^2 = 11.7 \), \( K = .73 \)).

IX. **DISCUSSION:**

The oak trees that were used to construct the log-framing members of Solitude Dependency were felled after the growing seasons of 1841, 1842 and 1843.
LITERATURE CITED


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