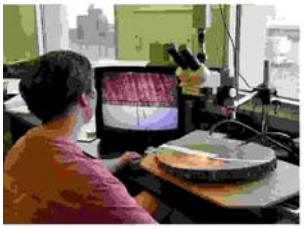

DENDROCHRONOLOGICAL DATING OF LONGLEAF PINE (*PINUS PALUSTRIS* MILL.) LOGS FROM EXHUMED DAM STRUCTURES, HOPE MILLS, NORTH CAROLINA

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August 11, 2005

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Introduction

In the Southeastern U.S., dendrochronological techniques have been used to determine construction dates of historical structures (Bowers and Grashot 1976; Stahle 1979; Bortolot *et al*. 2001; Mann 2002; Reding 2002; Wight and Grissino-Mayer 2004; Grissino-Mayer and van de Gevel 2005), infer past landscape vegetation patterns (Druckenbrod and Shugart 2004; Lafon 2004; Atchley 2004), attain climate information that predates regional climate records (Grissino-Mayer 1988; Stahle *et al*. 1988; Fekedulegn *et al*. 2003), and identify the historical frequency of forest disturbance events (Lafon and Speer 2002; Guyette and Spetich 2003; Schuler and McClain 2003). Intensive land-use practices in the eastern United States, such as timber exploitation and agricultural clearing since the 17th century, have removed many old-growth forests that would provide tree-ring information to identify construction dates for archaeological and historical structures (Wight and Grissino-Mayer 2004). Fortunately, modern chronologies from long-lived tree species often overlap with old-growth timbers from these structures to help provide probable dates of construction.

Dendroarchaeological techniques have long been applied to date many structures in the southwestern U.S. (for reviews, see Nash 1998, 2000, 2002 and Towner 2002), but have only recently been used in the southeastern U.S. Dendrochronological research on historic structures is growing rapidly in the eastern U.S., largely because a need exists to authenticate and verify the construction dates of historic structures in the region (Rosman 2005; Bannatyne 2005; Grissino-Mayer and van de Gevel 2005). Historical structures can be used to extend modern tree-ring chronologies into the 16th and 17th centuries (and earlier) and help date other wooden historical structures and prehistoric archaeological sites (Stahle 1979; Grissino-Mayer and van de Gevel 2005). Tree-ring dates from historical buildings must be interpreted carefully because timbers can be reused and logs can be replaced (Dean 1978, 1996, 1997; Grissino-Mayer and van de Gevel 2005). However, examining dendrochronological evidence, in the form of clustered cutting dates and the technique of crossdating timbers with existing chronologies, minimizes sources of error (Dean 1969; Stahle 1979; Nash 1999).

Methods

Field Collection and Initial Processing

We removed longleaf pine (*Pinus palustris* Mill.) cross sections from all accessible logs from the Hope Mills crib dam using a Stihl 044 chain saw (Figure 1). We used a chainsaw to remove sections from logs in the crib dam because the dam was going to be disassembled and removed from the site. Cross sections were labeled by location (2 letters), structure (2 letters), direction (1 letter), log position (1 letter), log number (2 numbers), and radius letter (e.g., "HMCDSE4A" = Hope Mills crib dam "HMCD", south aspect "S", log position "E", log number "4", radius "A"). Cross sections were wrapped in plastic (Figure 2) to ensure preservation of the samples while being transported to the Laboratory of Tree-Ring Science at the University of Tennessee. The cross sections were later surfaced using progressively finer sandpaper, beginning with 100-grit and ending with 400-grit (Orvis and Grissino-Mayer 2002). This process produced a wood surface with cellular features clearly defined under 10x magnification for clear ring identification. We drew two radii on each cross section extending from the innermost ring (pith) to the outermost complete ring along which to measure, which ensured bypassing particularly eroded and degraded portions of the surface.

We created a local anchored chronology from seven old-growth longleaf pine trees and three tree stumps found on the property of the Big Rockfish Presbyterian Church, approximately 5 km southeast from the Hope Mills crib dam. Two cores from each tree were extracted approximately 30 cm above ground level and at 180º angles from each other. Core samples were labeled (e.g., "HMCHR01A") and placed in paper straws before being transported to the laboratory. Tree cores were allowed to air-dry completely in these straws and were then glued to wooden core mounts with cells vertically aligned to ensure a transverse view of the wood surface. The cores and stump cross sections were surfaced using progressively finer sandpaper to reveal the cellular structure of the wood. We began the crossdating process by assigning the outermost complete ring on each core with the absolute year "2004" and marking every decade ring (1990, 1980, 1970, *etc*.) with a mechanical pencil. All cores and cross sections were first

graphically crossdated using the skeleton plot technique (Stokes and Smiley 1968; Swetnam *et al*. 1985; Figure 3). We then measured ring widths on all samples to the nearest 0.001 mm accuracy with a Velmex measuring stage coupled with MEASURE J2X software.

Internal Crossdating

Absolute dating of 12 crib dam logs was accomplished by (1) dating each series (cross-section radius) against all others ("internal crossdating") using graphical dating techniques, (2) measuring all ring widths, (3) creating an undated ("floating") chronology from the internally dated series, and (4) crossdating this chronology against a regional tree-ring chronology ("external crossdating"). The internal crossdating process began by assigning the innermost complete ring on each cross section the relative year "1" and marking every subsequent tenth ring with a mechanical pencil. We then created skeleton plots of from tree rings seen on the cross sections to relatively crossdate the tree rings of each series against all others (Figure 3). Skeleton plots rely on matching patterns of narrow tree rings in one series against narrow rings of the other series to ensure correct temporal placement (Stokes and Smiley 1968; Swetnam *et al*. 1985). We then measured the widths of all tree rings to 0.001 mm accuracy with a Velmex measuring stage coupled with MEASURE J2X software (Figure 4).

Statistical Verification of Crossdating

We confirmed the graphical crossdating and relative placements of all tree-ring series using COFECHA, a quality-control program that uses segmented time-series correlation techniques to confirm the temporal placements of all tree rings (Holmes 1983; Grissino-Mayer 2001). Because crossdating is a "high-frequency" process (pattern matching of sequences of individual rings), COFECHA removes all low-frequency trends using both spline-fitting algorithms and autoregressive modeling (Grissino-Mayer 2001). Such trends could also arise due to natural (e.g., local floods from the adjacent creek that might damage the surface on tree trunk) and human (e.g., turpentining and logging) disturbances that otherwise could mask the climate

signal desirable for accurate crossdating. COFECHA then tests consecutive 40-yr segments (with 20-yr overlaps) on each series with a temporary master chronology created from all other series. Crossdating is verified when the correlation coefficient for each tested segment exceeds 0.37 ($p < 0.01$), although coefficients are usually much higher (for example, $r > 0.51$, $p < 0.0001$).

Assessing Crossdating Quality

Crossdating quality was assessed by two statistical descriptors. First, the average mean sensitivity is a measure of the year-to-year variability desirable for crossdating success. Values of 0.20 are common for tree-ring data from the southeastern U.S. (DeWitt and Ames 1978). Second, the average interseries correlation is calculated in COFECHA by averaging together the Pearson correlation coefficients calculated for each measurement series when correlated against a master chronology created from the remaining series (Grissino-Mayer 2001). Statistical probabilities will vary because of the varying degrees of freedom (i.e., number of years – 2) for each measurement series being tested, but in general an interseries correlation coefficient of at least 0.40 is desirable for each series. Occasionally, some series were retained in the analyses (such as those from the diversion dam) because long portions of their series displayed high correlations with other series despite their overall low interseries correlation. The evaluated series were only included in further analyses if the graphical comparison and statistical analysis were both convincing.

Standardization of Tree-Ring Data

We standardized all series, a necessary procedure to remove most of the adverse effects from age-related growth trends and possible natural or human disturbances that could add noise to the tree growth series unrelated to the climate signal desired in chronology development (Cook 1987; Fritts 2001). Each ring measurement for all series is divided by a predicted annual value of growth based on a trend line or curve fit to the measurement data, resulting in a dimensionless index of growth for that year. Once each individual series was standardized, a

master “floating” (i.e., unanchored) chronology was created from tree-ring series obtained from the crib dam and diversion dam by averaging all indices of tree growth for each year from all series using the program CRONOL (Cook 1985). The early portion of the final chronology represented by only one series sometimes exhibits extreme fluctuations about the mean and therefore crossdating attempts with reference chronologies may be poor in the earlier years due to low sample depth. Only the portion of the chronology represented by two or more series was statistically evaluated for quality control and final absolute crossdating.

External Crossdating

Absolute (“external”) crossdating was achieved by using COFECHA to compare the undated (“floating”) master chronology with (1) our anchored longleaf pine church samples and (2) a longleaf pine chronology obtained from the International Tree-Ring Data Bank (2005) (IGBP PAGES/World Data Center for Paleoclimatology, Boulder, Colorado): Weymouth Woods State Park (35ºN, 79ºW), spanning AD 1671 to 1979, located 45 km northwest of the Hope Mills crib dam site. The final suggested placement made by COFECHA had to be convincing both graphically (similar patterns in wide and narrow rings) and statistically (correlation significant at $p < 0.001$) (Grissino-Mayer 2001). Once confirmed, we assigned calendar years to each individual undated measurement series.

Results

Descriptive Statistics

The average mean sensitivity was 0.29 (lowest = 0.23 for HMCDBC2B; highest = 0.42 for HMCHS02A; Table 1), a value similar to that found for the other eight longleaf pine chronologies developed in the U.S. and held in the International Tree-Ring Data Bank (2005), including the values derived for the measurement series used to create the reference chronology used in this study (Weymouth Woods State Park: 0.29). These results indicate the sampled trees were about average in their mean sensitivity year-to-year environmental fluctuations. The

average interseries correlation for the 43 Hope Mills cores and cross sections was 0.51 (lowest correlations = 0.31 and 0.35 for the two series from the diversion dam, n = 83 and 71 yrs respectively, $p < 0.001$ for both nonetheless; highest r = 0.64 for HMCHR06B, n = 267 yrs, $p < 0.0001$; Table 1). For comparison, the average interseries correlations for the Weymouth Woods State Park measurement series is 0.51.

External Crossdating

Comparison of the standard index chronology created from the Hope Mills measurement series graphically with the Weymouth Woods State Park measurement series revealed a strong dating agreement (Figure 5) that was verified statistically using COFECHA. The Hope Mills longleaf pine chronology is anchored from 1597 to 2003, although the match is less consistent prior to 1725 due to low sample depth. The visual congruency is noticeable in certain narrow rings common to the two chronologies formed in 1724, 1725, 1813, 1818, 1826, 1837, 1921, 1922, 1942, 1968 (although the actual magnitudes of the indices vary), and in the periods of low growth from 1770 to 1790 and from 1857 to 1879. Differences exist, however, such as in the opposite patterns of growth in 1755 and 1777.

Outermost Dates

The outermost dates for the twelve logs from the Hope Mills crib dam varied from 1750 to 1825. We found one major period of clustered dates from 1800 to 1820 (7 logs; Table 1). Only one log had an outermost date after 1820 (HMCD5B5A, outermost ring = 1825). We point out that the outermost rings from these samples were not cutting dates because the logs contained decayed sapwood and bark was not present to verify the date of tree death. The one log from the Hope Mills diversion dam we were able to date had an outermost ring of 1810, but again this was not a cutting date because some of the wood on the outer surface (i.e., sapwood) had eroded off while buried.

Discussion

Crossdating

The reason that lower correlations exist in some of the earlier time segments (1601 to 1725) for some individual series in the Hope Mills data set is low sample depth. Between 1600 and 1650, the Hope Mills chronology only consists of six logs. Furthermore, the chronology developed from the cores and cross sections taken from the Big Rockfish Presbyterian Church (n = 10) only overlapped with the logs collected from the Hope Mills crib dam (n = 12) from 1727 to1825, and even then the correlations in the overlap (recent series from the church site versus older series from the dam site) are weak because the outermost rings from series at the dam site are eroded and also malformed due to burial. A longer overlap with a larger sample depth is desirable and would help strengthen the dating and interseries correlations of samples between the two data sets. The samples that would bridge the gap between living trees and logs cut in the early 1800s may be found in local plank roads and railroad trestles made from longleaf pine, as well as stumps of longleaf pines used to make both these features (we found numerous well preserved stumps in proximity to both these features). Priority should be given to future collections that target these sites.

Undated Logs and Logs Not Processed

We additionally measured six radii, two each from three logs: HMCDSF5, HMCDSF6, and HMCDSF7. The dating of these six series is strong for a few of the tested segments internally against the other absolutely dated series, and the outer dates for these series, when adjusted, would indeed coincide with the outer dates for the other dated series. Nonetheless, the interseries correlations of these six series were too low to warrant inclusion in the final analyses, although we feel that with additional samples, these three logs could eventually be dated with absolute precision. Additionally, time, labor, and funding constraints prevented us from attempting to process and date sections from all the logs and smaller pieces of wood collected for this study. We cut a large number of samples from the crib dam logs (as many as were easily and

safely accessible) mainly to ensure that these samples could eventually be made available for future research, especially in the form of a master's thesis. These additional samples include: 8 sections from the crib (3 of these are structurally unsound, however), 3 cross sections from the old, abandoned railroad trestle, and 5 cross sections from the diversion dam. We also have 10 smaller partial pieces of wood collected from the upright planks of the diversion dam that could be processed. These unprocessed logs and pieces of wood will remain permanently archived at the Laboratory of Tree-Ring Science and University of Tennessee.

Effects of Possible Disturbances

The location of the Hope Mills crib dam was in relatively close proximity to the only other existing longleaf pine data set for this region. This other chronology had similar trends, although differences occurred in earlier portions of our chronology. These differences are expected because site specific environmental conditions (e.g., turpentining and producing products used for naval stores) may over-ride the regional macroclimate signal necessary for regional crossdating. English colonists in the mid-1700s used longleaf pines growing in the Coastal Plain physiographic province of the southeastern U.S. to collect resin used for the ship making industry (the gum naval stores; Grissino-Mayer *et al*. 2001). To collect resin from pine trees, individuals would use an ax to create a "box" at the base of the pine tree trunk, then "chip" or streak away bark, phloem, and outer xylem above the box to induce flow of resin outside the cut area and downward to the box where resin was collected (Frost 1993; Butler 1998; Grissino-Mayer *et al*. 2001; Figure 6). These anthropogenic disturbances would weaken trees and make them more vulnerable to other localized disturbances (Grissino-Mayer *et al*. 2001) and may influence tree physiological functioning, causing trees to form a very narrow growth ring or to not form a ring. This may explain the asynchronous years of 1755 and 1777 between the Hope Mills and Weymouth Woods State Park chronologies.

Interpreting the Outermost Dates

The outermost dates of the longleaf pine crib dam and diversion dam logs are not cutting dates due to the physical weathering of bark and sapwood of the buried logs during the past two centuries. The pressure and movement of water and sediment in suspension abraded the sapwood, resulting in the loss of bark and outer xylem rings. Even rings in the less-dense sapwood that were not eroded were lighter in color and structurally unsound (Figure 2). Nonetheless, the outer dates indicate the Hope Mills crib dam was constructed sometime in the late 1820s or 1830s. The construction date for the adjacent diversion dam was after 1810, but too few series were crossdated from this dam to conclusively indicate whether it was constructed at the same time or before the larger crib dam. These dendrochronological results could help verify information found in historical documents for the site.

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TABLE 1. Descriptive statistics for cores and cross-sections from the Hope Mills crib dam and Big Rockfish Presbyterian Church

Series	Begin Year	End Year	Mean Sensitivity	Interseries Correlation
HMCHR01A	1767	1965	.25	.46
HMCHR01B	1767	1965	.26	.49
HMCHR02A	1764	2003	.29	.55
HMCHR02B	1780	2003	.27	.54
HMCHR03A	1780	2003	.36	.42
HMCHR04A	1730	2003	.29	.52
HMCHR04B	1736	2003	.28	.64
HMCHR05A	1770	2003	.26	.61
HMCHR05B	1740	1965	.23	.53
HMCHR06A	1727	2003	.31	.50
HMCHR06B	1727	2003	.34	.64
HMCHR07A	1759	2003	.25	.60
HMCHR07B	1760	2003	.26	.58
HMCHS01A	1761	1944	.26	.45
HMCHS01B	1761	1937	.29	.50
HMCHS02A	1727	1884	.42	.41
HMCHS02B	1730	1890	.36	.53
HMCHS03A	1729	1965	.34	.51
HMCDBC2A	1739	1814	.24	.50
HMCDBC2B	1739	1816	.23	.48
HMCDEC3A	1601	1790	.28	.49
HMCDEC3B	1601	1740	.25	.44
HMCDEC4A	1604	1795	.33	.45
HMCDEC4B	1604	1804	.33	.48
HMCDED3A	1597	1798	.24	.51
HMCDED3B	1597	1774	.24	.50
HMCDSA4A	1612	1817	.23	.48
HMCDSA4B	1612	1798	.27	.62
HMCDSB5A	1743	1825	.29	.45
HMCDSB5B	1743	1816	.30	.48
HMCDSD2B	1680	1816	.23	.42
HMCDSD5A	1651	1750	.30	.46
HMCDSD5B	1629	1728	.28	.56
HMCDSD7A	1674	1802	.34	.60
HMCDSE4A	1640	1804	.29	.52
HMCDSE4B	1640	1810	.30	.46
HMCDSF4A	1627	1803	.30	.51
HMCDSF4B	1621	1781	.32	.52
HMCDSG6B	1658	1770	.32	.50
HMDDB01A	1728	1810	.20	.31
HMDDB01B	1728	1798	.22	.35

FIGURE 1. H.D. Grissino-Mayer using a chainsaw to remove cross sections from the Hope Mills crib dam.

FIGURE 2. Hope Mills crib dam cross section labeled and wrapped for transportation to the Laboratory of Tree-Ring Science.

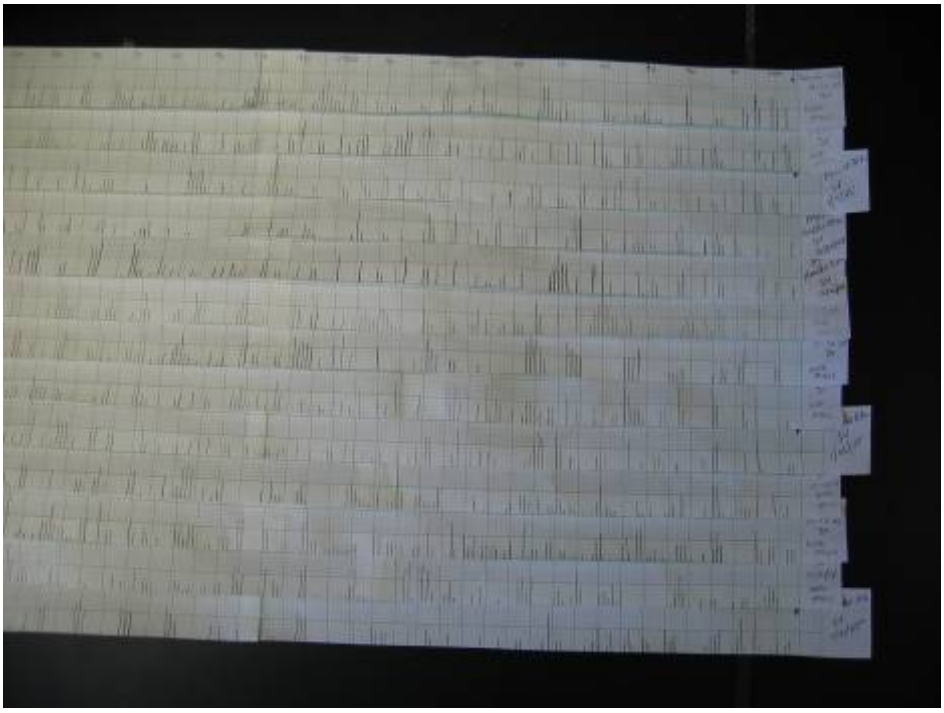

FIGURE 3. Graphical crossdating (called skeleton plots) of longleaf pine cores taken from living trees and stumps at Big Rockfish Presbyterian Church, Hope Mills, North Carolina.

FIGURE 4. J.L. Hart measuring the widths of tree rings on a cross section from the Hope Mills crib dam. This process took several months due to the lengths (i.e. extensive ages) of the tree-ring series on these longleaf pine sections.

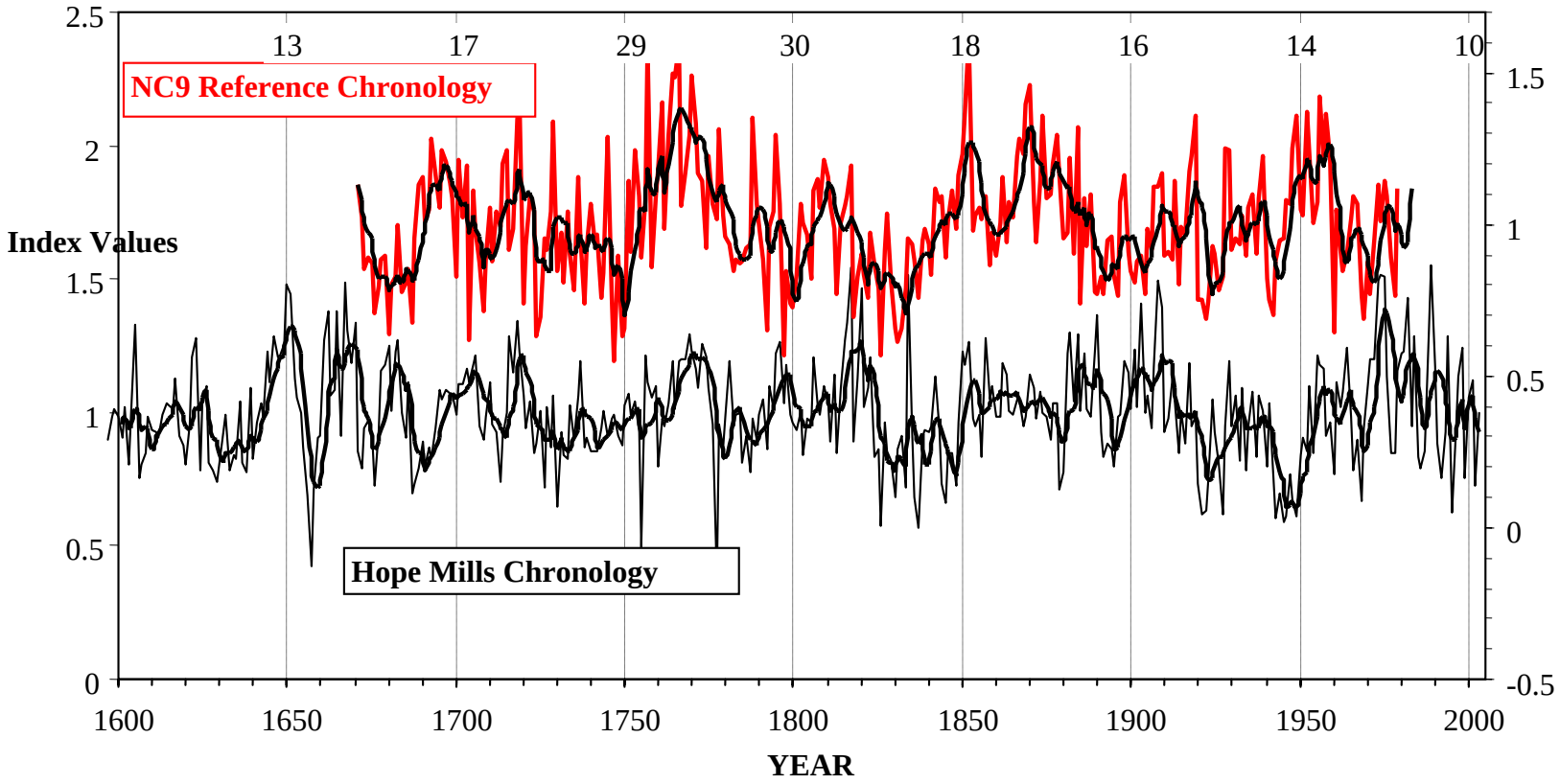

FIGURE 5. Graph showing the correspondence between the Hope Mills chronology (black) and the Weymouth Woods State Park chronology (red). Numbers at the top represent sample depth (number of cores and cross-sections) for the Hope Mills chronology. Five-year moving average trend lines help accentuate the similarities between the two graphs. Note how the overall, long-term trends show excellent agreement.

FIGURE 6. A “boxed” (cavity at the bottom for collecting resin) and “chipped” (angled streaking above the box) longleaf pine stump next to the Hope Mills crib dam.

APPENDIX 1: Raw measurement data for all final samples used in this study. The first 8 columns contain the samples ID, followed by the year. Each line then contains the 10 measurements for that decade, in 0.001 format (with decimals removed). The "-9999" is an end-of-series sentinel used by all dendrochronological software. This format (known as "Measurement" or "Decadal" format) is the internationally accepted format for raw tree-ring measurement data as explained at the National Climatic Data Center's International Tree-Ring Data Bank (ITRDB).

```
Hmchr01a1767  1292  1318  1228
Hmchr01a1770  1300  1006  1098  1640  1552  1394  1388     0   226   362
Hmchr01a1780   610   998   984  1110  1258   174   196   444   720   952
Hmchr01a1790  1014  1212  1152  1288  1110  1484  1782  1734  1176   800
Hmchr01a1800   956   780   642   584   956   896  1254   982  1002   988
Hmchr01a1810  1670  1320  1620  1840  1628  1914  2156  2478  1550  2040
Hmchr01a1820  2366  1284  2338  2344  2296  1550  2030  2132  1550  1890
Hmchr01a1830  1950  1972  2068  1682  3796  2724  2032  1150  2240  1746
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Hmchr01a1900   936   792  1080  1166   784   586   604   876  1194  1638
Hmchr01a1910   652   682   776   470   468   612   828   556   536   552
Hmchr01a1920   414   278   250   474   654   488   458   338   534   454
Hmchr01a1930   460   484   554   522   448   478   566   480   480   776
Hmchr01a1940   702   592   516   356   620   348   480   538   392   314
Hmchr01a1950   336   362   388   472   468   376   696   534   562   502
Hmchr01a1960   388   822   428   386   592   878 -9999
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Hmchr01b1770  1198   742   976   862   930   774  1064     0   190   312
Hmchr01b1780   450  1450  1514  1684  1316   246   156     0   328   442
Hmchr01b1790   638  1070   760   968   994  1404  1352  1078   762   718
Hmchr01b1800   936   862   824   722  1202  1180  1692  1572  1252  1682
Hmchr01b1810  1808  1204  1732  1600  1932  2558  3666  4074  1896  2202
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Hmchr01b1860  2600  1938  1754  1916  1146  1412  1666  1690  1654  1758
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Hmchr01b1910   964  1058  1008  1128  1158  1084  1268  1030  1032  1288
Hmchr01b1920   810   802   610   880  1032   920   916   698   916   918
Hmchr01b1930  1068   860   714   826   608   764   748   632   578   628
Hmchr01b1940   554   798   614   570   646   760   650   774   644   244
Hmchr01b1950   516   590   634   888   900   812   850   704   650   728
Hmchr01b1960   522   980   890   602   774   978 -9999
Hmchr02a1764   438   419   832   694  1049  1051
Hmchr02a1770   377   471   571   941   907   841   708   308   428   374
Hmchr02a1780   683  1128  1102   980  1405   217   231   278   790  1083
Hmchr02a1790  1262  1622  1425  1778  1459  1834  1879  1960  1363  1264
Hmchr02a1800  1693  1532  1686  1463  2087  2354  2197  2021  2182  2210
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Hmchr02a1810	2362	1925	2556	1995	2162	2807	2468	2609	1819	2265
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Hmchr02a1830	1151	1529	1326	1245	2661	1677	1099	868	1460	1288
Hmchr02a1840	1312	1458	1680	1373	1348	1456	1115	1272	1197	1266
Hmchr02a1850	1762	1750	1146	933	1070	1056	786	1755	1118	1124
Hmchr02a1860	874	778	1106	823	695	652	908	869	1240	861
Hmchr02a1870	1129	1168	860	879	799	687	749	860	685	372
Hmchr02a1880	368	905	600	462	678	562	796	496	386	811
Hmchr02a1890	1277	407	437	443	424	380	569	461	564	337
Hmchr02a1900	285	608	294	809	340	503	491	574	646	753
Hmchr02a1910	401	726	674	737	548	596	537	900	464	688
Hmchr02a1920	750	306	370	348	619	546	372	546	790	994
Hmchr02a1930	670	905	502	590	470	781	548	668	631	628
Hmchr02a1940	491	701	514	253	206	172	203	361	345	335
Hmchr02a1950	523	415	217	251	347	343	466	516	294	407
Hmchr02a1960	401	539	430	491	740	305	264	235	414	612
Hmchr02a1970	511	815	754	852	852	602	506	383	532	1073
Hmchr02a1980	1089	721	985	861	742	647	859	454	746	1286
Hmchr02a1990	1123	321	169	558	938	284	500	631	831	333
Hmchr02a2000	519	699	624	629	-9999					
Hmchr02b1780	1108	1158	1110	1398	1586	211	318	360	741	1097
Hmchr02b1790	1047	1260	1273	1865	1774	2038	1544	1360	1262	1195
Hmchr02b1800	1629	1982	2493	1725	1899	1762	2140	1993	2758	3227
Hmchr02b1810	2296	1756	2150	2241	2504	2440	3631	2439	945	2657
Hmchr02b1820	3004	3129	2111	3026	2118	2241	1784	3081	2123	1183
Hmchr02b1830	1470	1826	1816	1365	2484	1987	1194	1205	1595	2099
Hmchr02b1840	1770	1708	1462	1324	939	944	941	1273	927	1601
Hmchr02b1850	1435	1171	1139	962	1417	1137	1044	1553	1202	1380
Hmchr02b1860	858	861	1084	1069	927	766	888	1252	986	841
Hmchr02b1870	829	1001	1000	867	948	799	578	752	835	394
Hmchr02b1880	380	1153	1110	847	857	868	781	673	699	710
Hmchr02b1890	854	447	396	418	391	477	381	437	460	522
Hmchr02b1900	377	422	429	696	577	673	421	458	706	587
Hmchr02b1910	414	528	506	613	534	581	591	526	448	610
Hmchr02b1920	515	318	251	288	374	359	323	208	399	333
Hmchr02b1930	189	246	255	389	286	285	436	248	247	299
Hmchr02b1940	211	451	407	246	141	133	207	289	216	270
Hmchr02b1950	471	390	390	507	425	579	518	789	344	341
Hmchr02b1960	399	455	424	636	871	330	390	424	613	1142
Hmchr02b1970	730	943	992	922	1041	946	788	347	690	853
Hmchr02b1980	838	661	880	750	574	629	692	395	526	1088
Hmchr02b1990	947	332	234	767	958	357	528	917	848	308
Hmchr02b2000	351	750	486	553	-9999					
Hmchr03a1780	396	758	640	594	784	626	96	0	88	178
Hmchr03a1790	862	1532	1070	932	1192	786	2394	2588	1044	1250
Hmchr03a1800	726	1784	1612	1426	1324	1472	1756	762	834	1576
Hmchr03a1810	1682	1802	2718	1876	3792	4008	2916	3990	2344	2454
Hmchr03a1820	3496	1616	1226	1182	1000	948	590	1118	1134	1684
Hmchr03a1830	1884	3298	3098	2076	6034	2558	1308	1148	1872	1394
Hmchr03a1840	2092	2582	2822	2142	1604	1684	2294	1946	1262	1822
Hmchr03a1850	1924	2208	2224	1588	1824	1428	1318	1392	1414	1734
Hmchr03a1860	1414	1240	1488	1298	1212	2000	1544	1164	658	648
Hmchr03a1870	940	720	570	618	586	714	968	1250	554	358
Hmchr03a1880	256	922	474	558	420	718	1110	862	986	1532
Hmchr03a1890	1622	504	672	924	1142	770	504	878	816	820
Hmchr03a1900	666	1354	628	844	684	1040	492	434	558	500
Hmchr03a1910	454	348	404	362	502	564	444	562	606	646

Hmchr03a1920	290	392	414	464	772	646	380	442	546	670
Hmchr03a1930	836	672	504	738	598	660	1004	660	704	806
Hmchr03a1940	354	394	386	420	416	248	328	358	340	320
Hmchr03a1950	488	904	1744	1118	400	868	1294	538	310	254
Hmchr03a1960	190	194	356	280	396	530	346	578	530	1614
Hmchr03a1970	1672	1582	1220	2512	2634	2830	1606	1076	748	648
Hmchr03a1980	484	724	1094	506	792	1132	590	546	968	2092
Hmchr03a1990	1592	916	714	2004	1464	698	1034	1860	2386	820
Hmchr03a2000	1152	1230	498	530	-9999					
Hmchr04a1730	1014	1003	1348	137	126	1055	1315	1052	1647	738
Hmchr04a1740	617	1321	1218	111	618	1762	410	1270	944	1353
Hmchr04a1750	1957	1828	1230	1245	1510	917	1731	1703	1946	1841
Hmchr04a1760	1293	1891	1725	2221	3003	2316	2312	2371	1891	2142
Hmchr04a1770	1979	1898	1376	1847	1390	1751	1549	1278	1461	1103
Hmchr04a1780	1458	1620	1390	1571	1356	1612	1615	1188	1385	1187
Hmchr04a1790	1298	1460	1097	1276	1008	1399	1117	1136	1370	1137
Hmchr04a1800	949	852	978	679	1112	844	1400	862	556	853
Hmchr04a1810	481	947	1150	1116	1117	1658	1297	1790	1244	1124
Hmchr04a1820	1889	1042	1164	1339	643	811	455	536	518	1061
Hmchr04a1830	336	705	697	521	1413	970	444	440	530	752
Hmchr04a1840	550	855	873	868	655	555	771	962	649	777
Hmchr04a1850	1214	1226	1345	982	976	976	673	914	940	1143
Hmchr04a1860	952	1241	1235	1443	982	1297	1274	916	1019	860
Hmchr04a1870	1083	777	915	1025	859	666	734	953	786	839
Hmchr04a1880	770	1240	1259	1037	1144	916	848	786	695	749
Hmchr04a1890	834	424	627	628	744	544	939	744	645	635
Hmchr04a1900	625	1005	569	818	656	618	690	676	1283	1257
Hmchr04a1910	704	1037	953	819	674	888	537	1059	560	711
Hmchr04a1920	390	337	774	753	879	811	493	347	651	659
Hmchr04a1930	432	743	355	532	355	440	629	652	755	497
Hmchr04a1940	515	637	437	357	391	361	299	529	383	337
Hmchr04a1950	378	483	491	777	514	801	521	454	412	547
Hmchr04a1960	330	510	347	465	335	192	293	422	278	333
Hmchr04a1970	374	336	304	314	528	504	365	262	350	480
Hmchr04a1980	497	515	526	434	649	260	236	460	690	585
Hmchr04a1990	388	331	314	326	409	280	503	635	641	538
Hmchr04a2000	515	565	475	824	-9999					
Hmchr04b1736	1616	2766	1306	1068						
Hmchr04b1740	1324	1414	226	968	2476	606	1780	684	1154	1720
Hmchr04b1750	2122	2146	1892	1654	1986	1540	2738	2760	2534	2294
Hmchr04b1760	1456	1970	1834	2084	2314	2252	1758	2292	2306	3070
Hmchr04b1770	2142	1536	1766	2280	2172	1896	1764	870	1540	1508
Hmchr04b1780	1524	1488	1190	1288	1246	914	1152	966	836	874
Hmchr04b1790	916	822	826	1072	696	1272	1244	968	1232	1152
Hmchr04b1800	1190	962	1080	770	1088	1068	1726	1300	1170	1252
Hmchr04b1810	848	930	1062	696	906	1208	1144	1048	564	826
Hmchr04b1820	1030	740	810	634	550	654	446	694	930	822
Hmchr04b1830	424	614	726	608	1712	1042	618	760	1068	1172
Hmchr04b1840	1064	1058	1118	1126	974	854	914	874	776	1096
Hmchr04b1850	1130	1106	1260	1058	836	896	816	992	1250	1150
Hmchr04b1860	948	1266	1232	1220	1074	1038	1192	1114	970	1214
Hmchr04b1870	1168	976	1044	1210	1068	1026	976	918	1036	644
Hmchr04b1880	664	954	1084	726	1142	794	812	590	554	924
Hmchr04b1890	748	712	516	564	598	444	544	570	516	560
Hmchr04b1900	728	720	668	996	874	804	594	644	904	860
Hmchr04b1910	472	618	408	642	322	450	466	474	510	386
Hmchr04b1920	326	280	326	418	300	302	248	184	210	466

Hmchr04b1930	924	566	386	726	232	398	302	288	454	308
Hmchr04b1940	314	736	278	228	270	232	258	488	286	292
Hmchr04b1950	418	582	390	630	478	834	668	780	430	798
Hmchr04b1960	408	666	464	408	452	208	274	358	308	260
Hmchr04b1970	432	498	406	328	296	478	326	220	310	384
Hmchr04b1980	434	452	622	372	498	106	308	290	450	534
Hmchr04b1990	298	382	208	306	420	192	400	290	354	352
Hmchr04b2000	488	442	252	474	-9999					
Hmchr05a1770	1834	2188	1806	2122	1954	1408	1418	840	1680	1124
Hmchr05a1780	1528	1844	1654	1426	1738	1490	2490	1640	1744	1414
Hmchr05a1790	1496	1668	1332	2588	2052	2190	2116	1738	2352	1928
Hmchr05a1800	1182	998	1338	900	1424	1294	1906	1380	1500	1636
Hmchr05a1810	1294	1156	1426	944	1216	1760	1148	2334	874	1336
Hmchr05a1820	1240	888	1624	1352	920	926	510	1072	838	964
Hmchr05a1830	860	854	868	560	1162	824	568	484	724	978
Hmchr05a1840	800	882	1254	782	542	564	808	610	714	708
Hmchr05a1850	750	668	876	530	624	642	480	1176	986	912
Hmchr05a1860	814	762	1110	1052	1034	804	814	1090	918	842
Hmchr05a1870	1060	1096	772	764	922	818	782	802	814	606
Hmchr05a1880	718	892	870	968	1204	824	994	842	740	730
Hmchr05a1890	670	564	478	458	388	362	508	558	796	586
Hmchr05a1900	622	870	566	806	508	362	506	636	582	678
Hmchr05a1910	498	336	464	666	420	398	398	380	352	354
Hmchr05a1920	286	156	214	272	454	432	278	210	336	580
Hmchr05a1930	296	416	430	430	310	512	356	244	456	480
Hmchr05a1940	440	480	328	230	308	192	290	320	298	252
Hmchr05a1950	356	230	370	274	120	194	384	416	632	426
Hmchr05a1960	424	370	488	538	588	318	654	470	328	458
Hmchr05a1970	574	668	638	810	1518	1494	878	574	402	874
Hmchr05a1980	762	976	980	632	772	604	458	680	704	798
Hmchr05a1990	448	504	718	602	582	514	596	488	604	580
Hmchr05a2000	684	576	440	442	-9999					
Hmchr05b1740	620	346	333	680	753	1298	240	852	513	1278
Hmchr05b1750	2349	1955	1961	1774	2115	1432	2421	2324	1975	1992
Hmchr05b1760	1711	2133	1595	2213	2501	1453	1555	1837	1805	1792
Hmchr05b1770	1675	1451	855	1851	2059	1424	1555	411	1038	668
Hmchr05b1780	970	1151	992	1431	1655	1761	1809	1630	1676	1396
Hmchr05b1790	1490	1112	1048	1196	1308	1544	1501	1002	1496	1470
Hmchr05b1800	1522	1543	1372	1158	1468	1565	1994	1443	1771	1786
Hmchr05b1810	1673	1407	1957	1340	1492	1647	1273	1838	988	1319
Hmchr05b1820	1503	1226	1427	1074	895	789	513	649	926	808
Hmchr05b1830	628	904	1132	868	1636	1208	1038	800	1042	1090
Hmchr05b1840	1248	1094	1340	1346	902	848	1228	1150	1188	1268
Hmchr05b1850	1338	1132	1380	1180	1204	1148	1032	1304	1136	962
Hmchr05b1860	894	1196	1426	1842	1320	1140	1196	1470	1174	1020
Hmchr05b1870	1138	1166	1138	1356	1136	1174	1070	1254	940	568
Hmchr05b1880	596	768	730	806	608	540	632	596	600	808
Hmchr05b1890	552	650	520	464	488	510	580	394	450	508
Hmchr05b1900	502	532	374	352	264	212	350	326	446	456
Hmchr05b1910	366	354	368	370	316	412	256	202	282	266
Hmchr05b1920	146	146	76	192	244	340	220	148	216	258
Hmchr05b1930	342	314	288	434	234	364	350	284	358	346
Hmchr05b1940	346	442	292	156	258	186	306	246	350	326
Hmchr05b1950	420	396	496	556	418	398	396	560	696	636
Hmchr05b1960	580	730	808	642	998	746	-9999			
Hmchr06a1727	1902	1058	1490							
Hmchr06a1730	1432	2220	2450	504	752	1710	1622	2270	1212	776

Hmchr06a1740	904	1198	232	630	1634	172	634	1700	606	1146
Hmchr06a1750	1826	1906	1674	1278	1478	1196	2252	2906	2348	2300
Hmchr06a1760	994	1322	1254	1654	2770	1710	1990	2174	1872	2066
Hmchr06a1770	1696	942	1208	1620	1584	1866	1194	394	1142	984
Hmchr06a1780	1424	1348	1502	1780	1394	1604	1652	978	1214	902
Hmchr06a1790	1046	1180	866	1250	952	1132	698	706	1140	958
Hmchr06a1800	930	1080	1164	782	804	708	780	876	878	880
Hmchr06a1810	968	828	998	676	974	802	1360	1230	920	1400
Hmchr06a1820	1444	938	748	992	726	806	482	560	796	664
Hmchr06a1830	400	352	510	578	878	466	404	372	524	474
Hmchr06a1840	442	506	380	380	362	398	490	378	236	272
Hmchr06a1850	356	298	382	430	348	266	254	342	384	374
Hmchr06a1860	504	326	406	262	410	272	300	262	204	326
Hmchr06a1870	458	552	374	520	410	446	304	576	802	598
Hmchr06a1880	620	746	926	760	1118	682	830	508	588	738
Hmchr06a1890	616	646	638	494	444	538	746	484	838	710
Hmchr06a1900	504	766	648	714	384	430	458	566	560	474
Hmchr06a1910	488	222	418	268	298	286	234	356	440	278
Hmchr06a1920	190	248	198	230	140	262	284	234	334	334
Hmchr06a1930	300	468	232	292	254	246	438	304	538	264
Hmchr06a1940	224	332	200	190	260	326	144	340	338	202
Hmchr06a1950	240	298	464	350	372	644	492	814	566	480
Hmchr06a1960	282	542	594	616	596	644	684	666	408	510
Hmchr06a1970	658	540	822	978	650	724	588	644	510	774
Hmchr06a1980	876	962	792	424	990	300	362	472	1002	740
Hmchr06a1990	564	548	574	534	786	438	790	686	632	352
Hmchr06a2000	512	614	298	782	-9999					
Hmchr06b1727	2362	1726	1639							
Hmchr06b1730	1670	2488	1597	400	1076	1849	1651	1889	655	918
Hmchr06b1740	985	1152	201	653	1638	416	976	1645	415	1382
Hmchr06b1750	1909	1420	1506	1307	1390	963	2402	2123	1703	2019
Hmchr06b1760	989	1263	1245	1905	2008	1100	1676	1595	1240	1823
Hmchr06b1770	1898	1533	1413	2142	1766	1184	998	460	1211	645
Hmchr06b1780	1311	1224	1080	1359	1789	1212	1778	866	1223	784
Hmchr06b1790	1120	948	703	912	1131	1299	1097	825	1616	1418
Hmchr06b1800	1340	911	1035	594	861	829	1346	861	785	840
Hmchr06b1810	611	631	898	422	547	844	610	1165	364	1021
Hmchr06b1820	1580	1232	1336	1512	609	653	234	1120	903	741
Hmchr06b1830	352	547	774	425	669	292	293	114	184	243
Hmchr06b1840	214	214	190	293	145	134	225	205	118	382
Hmchr06b1850	262	254	353	309	360	231	230	455	198	257
Hmchr06b1860	339	269	418	374	316	207	195	247	199	286
Hmchr06b1870	431	508	385	386	476	388	352	371	684	368
Hmchr06b1880	399	722	883	615	854	428	495	794	816	1166
Hmchr06b1890	1098	1030	873	839	408	226	504	460	764	522
Hmchr06b1900	555	619	602	894	755	702	619	745	789	766
Hmchr06b1910	367	473	717	443	389	610	474	894	665	582
Hmchr06b1920	443	418	277	396	522	510	416	188	469	746
Hmchr06b1930	367	370	293	558	302	296	310	303	399	295
Hmchr06b1940	294	463	303	157	301	303	279	323	258	227
Hmchr06b1950	521	426	463	682	574	960	857	819	606	423
Hmchr06b1960	517	718	871	941	753	659	518	811	312	427
Hmchr06b1970	788	726	769	1169	1047	1351	1059	789	751	698
Hmchr06b1980	729	811	959	525	920	485	380	499	1022	702
Hmchr06b1990	588	481	475	490	618	255	360	572	407	308
Hmchr06b2000	561	555	289	336	-9999					
Hmchr07a1759	3622									

Hmchr07a1760	378	854	1164	996	1396	806	1308	2226	1812	3212
Hmchr07a1770	2368	1952	2608	2950	2256	1544	1252	740	1736	1326
Hmchr07a1780	1954	2212	1828	1862	1818	1368	1488	1262	1232	1248
Hmchr07a1790	1318	1290	920	1502	1236	1554	1518	1734	1464	1732
Hmchr07a1800	1610	1722	1390	1302	1492	1276	1616	1182	1598	1378
Hmchr07a1810	902	1124	1662	760	1056	1144	1560	1354	660	762
Hmchr07a1820	1156	1300	1142	1208	684	912	510	1176	462	432
Hmchr07a1830	384	420	506	504	1004	678	426	410	922	1088
Hmchr07a1840	790	544	828	316	314	240	482	338	402	648
Hmchr07a1850	766	702	630	298	324	508	446	940	608	594
Hmchr07a1860	422	540	758	524	556	638	570	676	556	548
Hmchr07a1870	736	742	684	644	556	488	648	588	536	574
Hmchr07a1880	788	1278	1648	1454	1266	1064	1330	976	952	862
Hmchr07a1890	1010	882	494	604	688	664	642	838	832	928
Hmchr07a1900	900	766	840	1176	938	858	780	990	1330	964
Hmchr07a1910	740	764	716	732	566	688	516	574	562	652
Hmchr07a1920	448	462	704	458	642	632	600	446	740	750
Hmchr07a1930	602	744	546	686	566	554	560	434	426	542
Hmchr07a1940	404	368	362	412	414	324	370	354	258	344
Hmchr07a1950	186	254	230	526	318	686	606	434	324	448
Hmchr07a1960	394	564	470	588	858	660	662	830	456	730
Hmchr07a1970	792	836	948	1390	1222	1150	836	846	750	900
Hmchr07a1980	1120	1096	1532	910	1276	1014	952	1034	1376	1550
Hmchr07a1990	1160	1316	960	978	1146	626	884	1120	1042	740
Hmchr07a2000	1418	992	516	766	-9999					
Hmchr07b1760	1644	2578	1708	3100	1684	2500	2138	1934	2436	2634
Hmchr07b1770	2674	1390	1180	2780	2910	1794	1706	1422	2318	1404
Hmchr07b1780	1942	2052	1498	1700	1686	1974	2740	1906	2746	1722
Hmchr07b1790	2010	2348	1974	1984	1788	2378	2666	1852	2494	1710
Hmchr07b1800	1740	1630	1598	1386	1700	1498	1716	1342	1164	1280
Hmchr07b1810	1036	908	1418	828	1242	1122	1600	1770	932	1318
Hmchr07b1820	1612	1316	1454	1422	756	584	482	1076	440	402
Hmchr07b1830	312	358	408	474	1026	612	434	408	820	820
Hmchr07b1840	798	958	1014	704	672	458	702	972	598	724
Hmchr07b1850	1212	982	1198	778	558	772	666	1462	572	644
Hmchr07b1860	514	528	1018	618	688	420	416	552	566	572
Hmchr07b1870	600	580	334	630	626	468	410	582	506	690
Hmchr07b1880	968	1734	1486	1476	1826	1540	1300	1264	832	1084
Hmchr07b1890	1440	438	602	580	808	668	786	1112	1286	1470
Hmchr07b1900	898	960	1010	1698	916	832	812	1316	1404	1236
Hmchr07b1910	862	970	1646	726	572	490	468	1040	502	330
Hmchr07b1920	410	364	418	620	612	510	654	512	868	984
Hmchr07b1930	630	786	612	800	728	614	670	508	730	868
Hmchr07b1940	658	508	380	456	522	570	516	434	398	476
Hmchr07b1950	586	746	448	644	432	552	546	398	406	494
Hmchr07b1960	276	390	578	634	708	454	440	440	300	464
Hmchr07b1970	538	564	548	642	606	498	510	386	456	488
Hmchr07b1980	498	792	744	524	838	536	486	706	928	1256
Hmchr07b1990	1054	1054	784	1180	1604	652	706	816	1128	612
Hmchr07b2000	948	942	640	748	-9999					
HMCHS01A1761	385	723	493	656	373	250	516	619	1159	
HMCHS01A1770	665	590	887	1724	1649	1676	1002	582	1968	1196
HMCHS01A1780	1679	2442	1747	1589	2010	1731	960	944	1396	1102
HMCHS01A1790	1462	1582	1423	1437	1254	1735	1798	1747	1771	1310
HMCHS01A1800	1299	1451	1415	1046	1049	1198	1523	1587	1015	1205
HMCHS01A1810	1084	771	998	754	1215	1105	985	1626	776	1378
HMCHS01A1820	1836	1390	1154	1331	660	686	370	381	312	446

HMCHS01A1830	747	607	647	573	2314	878	1071	587	618	595
HMCHS01A1840	753	711	712	852	1081	833	1109	844	729	653
HMCHS01A1850	1358	1088	1355	1162	1265	1173	797	940	945	826
HMCHS01A1860	748	1047	1074	1261	1322	1224	1205	1113	456	850
HMCHS01A1870	1376	1179	1258	1311	1292	966	998	902	808	650
HMCHS01A1880	671	818	823	628	819	656	1076	586	709	1022
HMCHS01A1890	1136	921	1179	845	1023	937	1815	1283	1571	1418
HMCHS01A1900	1507	1700	1657	1096	824	695	577	582	845	825
HMCHS01A1910	767	431	640	578	709	769	541	1121	802	921
HMCHS01A1920	673	665	488	647	838	656	659	489	513	699
HMCHS01A1930	787	786	728	790	620	793	1213	401	1086	602
HMCHS01A1940	729	900	562	661	763	-9999				
HMCHS01B1761	659	1047	619	1063	372	408	1131	1136	1463	
HMCHS01B1770	1331	1451	906	1809	1806	1748	1750	971	1709	1609
HMCHS01B1780	1915	2682	2067	2182	2170	1411	1296	1229	1953	1200
HMCHS01B1790	1690	2416	1445	2062	2077	2241	2757	2077	2504	2163
HMCHS01B1800	1840	1586	1116	853	1097	1519	1836	1407	1368	979
HMCHS01B1810	981	916	1433	898	993	1308	1602	1704	805	1164
HMCHS01B1820	1140	1079	1623	1691	797	780	350	1248	1244	1185
HMCHS01B1830	1142	980	1301	977	2332	1226	1055	526	913	886
HMCHS01B1840	1043	510	685	579	463	452	765	451	554	829
HMCHS01B1850	1151	1113	1254	1271	1286	1657	1043	1389	1028	1229
HMCHS01B1860	1420	2015	2782	2358	1886	1647	1646	1728	1543	1743
HMCHS01B1870	2077	691	703	998	1295	1879	1280	1369	1439	1201
HMCHS01B1880	1174	1307	1283	653	557	591	526	534	655	845
HMCHS01B1890	1240	1058	1455	1387	702	480	1401	1074	1957	1470
HMCHS01B1900	1427	1653	3555	2510	1506	2214	2008	2315	3044	2512
HMCHS01B1910	1426	1449	1924	1701	1062	1244	849	2016	841	853
HMCHS01B1920	500	667	1026	928	1290	1114	1046	683	725	1758
HMCHS01B1930	800	983	665	1054	479	665	1370	863	-9999	
HMCHS02A1727	722	362	802							
HMCHS02A1730	1598	1748	1846	456	1352	2302	766	1390	440	186
HMCHS02A1740	742	1070	546	1730	466	1524	444	1448	1178	986
HMCHS02A1750	710	300	608	2710	822	876	1822	406	1170	1310
HMCHS02A1760	230	1352	1256	1942	1684	972	1112	1544	1508	1826
HMCHS02A1770	2714	2538	1300	1960	2040	2816	2472	1300	2594	2188
HMCHS02A1780	1638	2504	502	480	682	2404	3016	3482	2728	2208
HMCHS02A1790	2594	1974	2432	2522	1960	2486	1824	1300	1348	1868
HMCHS02A1800	1368	1092	1552	1742	1972	1706	1510	2416	2218	1836
HMCHS02A1810	1714	926	2002	744	410	1394	1646	1938	1292	998
HMCHS02A1820	2416	912	988	1168	856	1218	744	1004	842	866
HMCHS02A1830	622	1558	1060	910	1708	692	474	272	916	956
HMCHS02A1840	954	878	1408	900	642	590	980	668	566	1144
HMCHS02A1850	1564	1714	1568	1146	1020	1396	1308	1730	1386	1362
HMCHS02A1860	1070	1096	1216	1140	1094	1232	1608	1224	1234	1410
HMCHS02A1870	1158	1082	984	908	964	1282	842	586	868	182
HMCHS02A1880	164	572	662	512	632	-9999				
HMCHS02B1730	388	140	362	932	1650	2418	1826	2372	860	1936
HMCHS02B1740	594	326	986	1106	222	1094	2108	542	1442	406
HMCHS02B1750	1586	1350	1680	970	654	630	3496	1068	1346	1960
HMCHS02B1760	874	1534	1416	466	1686	1250	1778	2070	1190	2096
HMCHS02B1770	1620	1738	1834	3202	3380	1746	1352	1100	2766	2630
HMCHS02B1780	2740	2896	2496	2498	2664	664	478	960	2430	2622
HMCHS02B1790	2354	2064	1940	2598	2242	3568	4214	2634	3610	2422
HMCHS02B1800	1648	1154	1704	1096	2042	1668	2060	1910	1996	1650
HMCHS02B1810	1410	1184	1664	1224	1824	2114	2398	2718	1802	1914
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HMCHS02B1830	1126	1344	1320	772	1530	662	648	686	1656	1492
HMCHS02B1840	1194	1436	1820	1768	1168	1150	920	844	842	1328
HMCHS02B1850	1920	1964	1712	1402	1482	1756	1364	1822	1406	1548
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HMCHS02B1880	252	250	844	438	646	540	874	734	768	954
HMCHS02B1890	938	-9999								
HMCHS03A1729	1367									
HMCHS03A1730	352	569	358	643	1367	1444	332	1220	1921	995
HMCHS03A1740	1290	507	436	745	926	765	2107	346	1365	313
HMCHS03A1750	1541	1464	1384	1280	1125	852	2615	934	943	1886
HMCHS03A1760	713	1057	1164	704	1024	824	1547	1913	1001	1395
HMCHS03A1770	1252	1425	1330	2200	2026	1434	1483	1181	2499	1645
HMCHS03A1780	2657	3246	2112	2403	2339	1125	1351	1048	2122	1928
HMCHS03A1790	2712	2217	1809	2741	2184	3828	3540	2589	2948	2569
HMCHS03A1800	1549	1162	2144	1833	2591	2091	1936	1388	1446	1517
HMCHS03A1810	1752	1783	1685	1369	2214	2619	2153	2722	2074	1205
HMCHS03A1820	2180	817	1164	1424	1290	1457	767	1032	988	692
HMCHS03A1830	484	721	802	698	1392	565	542	688	877	1022
HMCHS03A1840	1031	1148	1424	996	682	435	721	647	619	573
HMCHS03A1850	1242	1439	1578	865	589	706	752	1353	1293	1658
HMCHS03A1860	1191	519	898	914	503	697	833	860	873	810
HMCHS03A1870	942	870	803	1152	528	707	580	821	626	131
HMCHS03A1880	182	342	469	439	500	362	753	593	468	790
HMCHS03A1890	871	555	376	497	393	399	493	527	442	560
HMCHS03A1900	427	447	331	288	302	510	407	759	808	489
HMCHS03A1910	391	436	666	512	367	493	521	601	605	512
HMCHS03A1920	560	275	301	221	474	354	480	326	535	731
HMCHS03A1930	463	473	390	593	567	649	969	618	575	672
HMCHS03A1940	110	339	364	243	236	242	194	269	324	428
HMCHS03A1950	466	629	515	481	430	957	607	696	323	481
HMCHS03A1960	412	540	444	590	671	601	-9999			
HMCDBC2A1739	1104									
HMCDBC2A1740	980	1336	1222	1814	1596	1938	2268	2492	1926	2128
HMCDBC2A1750	2666	2846	2102	2776	2386	1774	2410	2750	2324	2786
HMCDBC2A1760	2334	2924	2062	2480	3542	2460	3166	1826	2324	2584
HMCDBC2A1770	2480	2356	1968	2562	2162	2486	1702	1622	2666	2108
HMCDBC2A1780	2142	2220	822	1110	1332	1884	2118	1660	1808	1584
HMCDBC2A1790	2156	1856	834	1696	1572	1446	2056	1224	1506	1322
HMCDBC2A1800	1486	1338	1444	724	1344	1176	1888	1540	1334	1428
HMCDBC2A1810	1336	1084	1126	786	1316	-9999				
HMCDBC2B1739	1098									
HMCDBC2B1740	1358	1482	1320	1930	2054	2610	3044	3180	2952	3330
HMCDBC2B1750	3502	3208	2358	3312	2570	1710	3634	3564	3102	3510
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HMCDBC2B1770	3014	2926	2794	2486	2340	2630	1874	1678	2788	1966
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HMCDBC2B1790	1738	1340	692	1518	1338	1270	1418	926	1028	1364
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HMCDEC3A1601	3050	3590	2530	2810	4070	2330	2330	2840	3100	
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HMCDEC3A1620	1760	2050	2780	2840	2270	2420	2240	1770	1610	1750
HMCDEC3A1630	1820	2130	2150	1680	1960	1690	2530	1870	1940	2500
HMCDEC3A1640	1760	2380	1970	1890	2130	1880	1840	1720	1670	1440
HMCDEC3A1650	1720	1520	730	930	840	760	900	660	820	1160
HMCDEC3A1660	1030	1530	1690	1320	1320	1590	1050	1290	740	850

HMCDEC3A1670	1140	850	700	670	810	810	590	600	700	590
HMCDEC3A1680	760	450	640	660	600	400	530	140	180	160
HMCDEC3A1690	120	270	270	360	550	450	600	530	590	80
HMCDEC3A1700	250	270	400	530	410	200	380	480	370	180
HMCDEC3A1710	120	220	310	290	380	440	400	310	480	390
HMCDEC3A1720	280	220	340	310	240	150	120	200	210	230
HMCDEC3A1730	210	260	290	290	240	270	360	300	390	170
HMCDEC3A1740	230	70	170	110	230	170	240	280	370	190
HMCDEC3A1750	150	210	360	410	470	340	480	420	460	380
HMCDEC3A1760	520	690	550	570	720	740	630	420	570	300
HMCDEC3A1770	430	410	310	340	310	480	440	0	280	100
HMCDEC3A1780	240	370	220	310	340	350	470	530	470	570
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HMCDEC3B1601	3180	3670	2110	2290	3120	2140	2040	1960	2540	
HMCDEC3B1610	2260	2260	2230	2550	2630	2600	2080	2270	2200	1750
HMCDEC3B1620	1820	2190	2600	2200	1580	2340	2060	1610	1430	1530
HMCDEC3B1630	1470	1840	1730	1370	1470	1400	1770	1490	1680	1660
HMCDEC3B1640	1310	1780	1450	1470	1740	1490	1700	1500	1640	1550
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HMCDEC3B1660	1010	1380	1300	1060	1200	1210	980	1070	630	950
HMCDEC3B1670	1180	680	500	750	630	570	430	460	630	490
HMCDEC3B1680	690	470	580	570	580	380	400	290	220	170
HMCDEC3B1690	80	250	230	310	420	330	480	400	390	140
HMCDEC3B1700	110	170	180	250	290	280	200	340	370	330
HMCDEC3B1710	220	260	200	300	320	740	690	370	470	510
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HMCDEC4A1604	1480	1446	746	940	970	852				
HMCDEC4A1610	950	1178	782	964	1308	1306	1276	1258	862	2864
HMCDEC4A1620	910	698	950	1326	772	830	818	762	704	684
HMCDEC4A1630	822	888	622	448	436	688	1002	556	256	600
HMCDEC4A1640	706	900	976	840	1050	854	1136	1296	1112	1512
HMCDEC4A1650	1340	1196	1120	1210	968	852	828	656	612	906
HMCDEC4A1660	822	1046	1330	390	752	1152	630	1290	706	854
HMCDEC4A1670	900	372	458	196	228	196	448	480	610	952
HMCDEC4A1680	756	814	1202	796	682	796	250	390	422	278
HMCDEC4A1690	348	398	350	370	164	364	566	464	496	716
HMCDEC4A1700	630	674	584	678	926	660	592	626	704	768
HMCDEC4A1710	686	736	804	686	956	876	1244	940	666	712
HMCDEC4A1720	678	310	520	508	340	592	378	694	504	202
HMCDEC4A1730	242	300	292	468	768	364	556	636	658	1144
HMCDEC4A1740	714	1024	948	720	986	810	902	986	1152	946
HMCDEC4A1750	2132	1244	800	1466	1344	0	876	746	636	974
HMCDEC4A1760	698	684	600	656	972	748	866	540	1472	1378
HMCDEC4A1770	1018	1286	824	700	848	768	588	0	592	906
HMCDEC4A1780	838	404	262	276	448	404	366	616	696	462
HMCDEC4A1790	608	494	618	582	646	926	-9999			
HMCDEC4B1604	1824	1548	766	572	550	798				
HMCDEC4B1610	1044	874	1002	886	1324	1326	1520	1168	946	3470
HMCDEC4B1620	868	738	984	1258	564	742	882	748	554	558
HMCDEC4B1630	786	664	638	350	468	586	826	404	154	898
HMCDEC4B1640	596	760	548	560	754	728	932	1030	848	1024
HMCDEC4B1650	1110	1178	978	1090	954	1028	740	412	614	938
HMCDEC4B1660	642	958	1086	514	564	1122	620	870	834	932
HMCDEC4B1670	634	518	520	232	232	262	508	618	890	1396
HMCDEC4B1680	932	886	1210	894	634	806	266	264	354	262

HMCDEC4B1690	380	324	470	580	372	506	790	594	422	726
HMCDEC4B1700	704	594	674	848	1340	960	856	832	888	926
HMCDEC4B1710	902	744	834	744	994	672	1296	892	766	878
HMCDEC4B1720	846	482	878	614	606	974	604	1058	152	468
HMCDEC4B1730	286	262	350	444	676	630	698	1386	1116	858
HMCDEC4B1740	996	948	848	998	922	654	586	992	964	1362
HMCDEC4B1750	1066	2396	1268	806	852	0	1088	838	640	602
HMCDEC4B1760	888	786	658	780	738	1318	1120	1710	1036	1408
HMCDEC4B1770	1594	1890	1618	992	910	906	648	0	686	646
HMCDEC4B1780	884	892	468	274	320	494	492	544	784	846
HMCDEC4B1790	524	812	722	808	718	708	838	968	944	812
HMCDEC4B1800	1554	2218	2454	1188	946	-9999				
HMCDED3A1597	2833	3179	3364							
HMCDED3A1600	2804	2450	2419	2605	2550	3478	2079	2244	2078	2288
HMCDED3A1610	1962	2003	2008	2672	1960	2028	2326	2400	2279	1880
HMCDED3A1620	1750	1807	2110	1936	1592	1666	2035	1936	1294	836
HMCDED3A1630	779	870	1569	890	840	705	668	689	638	920
HMCDED3A1640	602	1076	1005	715	1859	1490	1202	1085	1307	1303
HMCDED3A1650	1379	1356	893	902	1007	803	578	336	557	987
HMCDED3A1660	766	987	1094	1289	1007	1625	1153	1451	1442	960
HMCDED3A1670	1157	822	425	885	910	918	444	859	682	794
HMCDED3A1680	883	527	984	1270	537	555	588	562	529	536
HMCDED3A1690	500	437	517	330	310	456	313	450	463	435
HMCDED3A1700	480	623	620	475	472	622	708	503	413	635
HMCDED3A1710	694	518	369	356	347	541	595	466	556	630
HMCDED3A1720	325	395	314	356	257	429	329	506	390	385
HMCDED3A1730	256	373	636	845	646	454	613	615	440	753
HMCDED3A1740	606	524	805	774	612	784	675	575	521	558
HMCDED3A1750	591	840	573	1061	638	454	781	694	544	864
HMCDED3A1760	546	499	456	512	909	696	781	718	552	795
HMCDED3A1770	609	740	1070	883	731	778	589	392	663	524
HMCDED3A1780	519	565	431	398	489	582	710	578	682	543
HMCDED3A1790	545	959	545	863	699	529	747	574	783	-9999
HMCDED3B1597	2736	2790	2568							
HMCDED3B1600	2836	2562	2624	2210	2314	2782	1976	2588	2776	2384
HMCDED3B1610	1774	1736	1778	2480	2732	2246	2086	2192	1672	1912
HMCDED3B1620	1772	2260	2932	2394	1712	2150	1862	1168	1184	1122
HMCDED3B1630	1152	1310	1304	872	1038	850	1164	828	736	1006
HMCDED3B1640	692	506	758	672	772	562	944	798	874	824
HMCDED3B1650	900	1260	838	630	730	478	694	376	528	516
HMCDED3B1660	528	584	718	612	516	840	704	1440	1234	812
HMCDED3B1670	908	596	442	636	824	552	392	984	696	552
HMCDED3B1680	562	528	600	908	490	504	452	442	290	428
HMCDED3B1690	400	266	266	200	276	382	230	406	348	296
HMCDED3B1700	352	516	528	380	366	824	556	506	334	468
HMCDED3B1710	592	406	316	334	408	460	436	360	452	450
HMCDED3B1720	430	340	326	310	300	534	318	566	330	470
HMCDED3B1730	334	504	350	412	648	434	574	834	508	612
HMCDED3B1740	610	436	930	684	778	792	586	514	422	442
HMCDED3B1750	428	686	570	862	420	336	458	492	356	518
HMCDED3B1760	396	460	428	320	284	382	416	536	404	352
HMCDED3B1770	394	470	398	298	366	-9999				
HMCDSA4A1612	270	412	566	542	508	644	536	636		
HMCDSA4A1620	506	510	690	844	306	976	828	536	846	1288
HMCDSA4A1630	1556	2046	1826	1778	1970	1976	2450	2580	2770	2668
HMCDSA4A1640	2566	2642	2442	2618	2882	2266	2504	2598	2452	2266
HMCDSA4A1650	2286	2190	1842	1500	1416	1518	1290	1000	1800	1326

HMCDSA4A1660	2278	2826	3166	2466	2172	2064	1664	2540	2204	2126
HMCDSA4A1670	2238	1306	1166	974	1236	1086	628	854	1080	1522
HMCDSA4A1680	2178	1118	1392	1460	858	1110	1582	1618	1320	1190
HMCDSA4A1690	1158	766	764	918	906	1126	1014	1514	1498	1550
HMCDSA4A1700	1092	1602	1156	1036	1138	1426	1598	700	690	1098
HMCDSA4A1710	1422	984	994	642	1064	850	766	774	1064	910
HMCDSA4A1720	780	844	584	564	766	898	406	578	284	312
HMCDSA4A1730	328	402	376	560	494	442	536	482	398	346
HMCDSA4A1740	414	506	586	572	546	470	586	704	310	222
HMCDSA4A1750	368	280	352	296	252	338	394	316	338	340
HMCDSA4A1760	368	316	436	472	404	474	582	494	604	574
HMCDSA4A1770	504	412	382	246	158	178	272	0	312	264
HMCDSA4A1780	294	536	430	446	390	474	494	452	400	518
HMCDSA4A1790	532	522	368	492	458	498	672	552	546	524
HMCDSA4A1800	522	584	716	454	464	634	584	576	838	854
HMCDSA4A1810	702	432	548	492	598	646	942	868	-9999	
HMCDSA4B1612	1216	1104	700	618	648	624	892	934		
HMCDSA4B1620	794	1144	1724	1678	1452	1786	2042	1376	1440	1510
HMCDSA4B1630	1062	1426	1736	1470	2066	2236	2568	2084	2212	3034
HMCDSA4B1640	2474	2606	2786	2794	3022	2834	2936	2962	2894	2726
HMCDSA4B1650	3134	2936	2524	2124	2000	1954	1626	1112	1598	1434
HMCDSA4B1660	1608	2096	2272	1814	1640	1926	1268	2186	2440	1762
HMCDSA4B1670	2058	1204	1508	1348	1508	1366	1030	1042	1876	1806
HMCDSA4B1680	2052	950	1634	1718	1498	1250	1866	956	1096	1282
HMCDSA4B1690	1514	738	1374	1246	976	1526	1234	1336	1162	1612
HMCDSA4B1700	972	1178	1322	844	1240	1258	1468	382	598	710
HMCDSA4B1710	988	1010	702	478	620	786	906	662	1088	938
HMCDSA4B1720	892	552	798	522	750	564	324	730	334	958
HMCDSA4B1730	358	570	508	636	660	252	462	504	516	436
HMCDSA4B1740	488	480	566	594	490	534	586	582	342	192
HMCDSA4B1750	408	292	366	302	286	302	478	346	400	332
HMCDSA4B1760	408	470	454	584	554	728	684	586	812	644
HMCDSA4B1770	754	902	672	715	272	410	458	0	417	520
HMCDSA4B1780	542	720	522	574	652	486	686	586	590	510
HMCDSA4B1790	624	584	372	506	472	608	774	580	926	-9999
HMCDSB5A1743	1947	1265	415	1494	1179	1090	1541			
HMCDSB5A1750	814	1140	830	1177	1686	294	924	1446	1602	1211
HMCDSB5A1760	657	2190	2239	2331	2261	1420	2123	2026	2195	2586
HMCDSB5A1770	3621	2154	2283	2798	2758	2501	2573	956	1525	1740
HMCDSB5A1780	2153	2124	1858	1621	1460	1634	1510	1669	1725	1688
HMCDSB5A1790	2434	2593	2513	2649	3161	2662	2076	1560	1912	1077
HMCDSB5A1800	859	1111	1532	1202	529	977	1652	1521	1364	1867
HMCDSB5A1810	1652	2021	1920	1453	1873	1593	1392	1150	1366	1189
HMCDSB5A1820	869	817	718	1336	941	1059	-9999			
HMCDSB5B1743	2033	1800	1947	1681	2019	2140	324			
HMCDSB5B1750	1132	1270	1063	1208	1447	286	888	1697	1850	1418
HMCDSB5B1760	1102	1946	2360	3261	2265	1308	2706	2496	2266	2196
HMCDSB5B1770	3004	2868	2791	2311	2658	2496	1714	634	1483	1489
HMCDSB5B1780	2532	2976	2622	3509	1989	2058	2909	2324	2250	2227
HMCDSB5B1790	2942	2531	2762	2239	2211	2898	3043	2037	2151	1497
HMCDSB5B1800	1125	1429	1426	1064	448	417	904	783	889	1379
HMCDSB5B1810	1855	1821	1996	1448	2026	1649	1766	-9999		
HMCDSD2B1680	1563	1362	1526	1780	1500	1632	1698	734	1238	1569
HMCDSD2B1690	1624	1180	1077	1122	1574	2423	1155	1137	901	1113
HMCDSD2B1700	1128	904	1151	1328	1027	1020	1182	799	862	1114
HMCDSD2B1710	1163	1126	1106	570	631	842	1238	1236	1189	878
HMCDSD2B1720	872	1050	1110	586	1166	873	689	978	956	1315

HMCDSD2B1730	698	1380	793	748	990	613	923	974	809	840
HMCDSD2B1740	878	784	781	713	880	828	714	955	756	897
HMCDSD2B1750	793	902	670	672	332	322	489	959	593	431
HMCDSD2B1760	452	660	480	489	435	618	920	703	600	408
HMCDSD2B1770	580	687	540	435	471	429	328	285	434	420
HMCDSD2B1780	274	633	613	461	520	450	501	355	334	306
HMCDSD2B1790	288	319	295	678	608	463	388	309	426	416
HMCDSD2B1800	537	367	477	482	422	672	861	855	495	742
HMCDSD2B1810	663	509	686	1061	937	1126	1058	-9999		
HMCDSD5A1651	2037	1603	1166	1112	1135	844	279	1007	938	
HMCDSD5A1660	785	1142	1031	946	898	1216	691	1362	1465	1255
HMCDSD5A1670	1549	937	1065	1413	1393	1335	908	1070	1393	1389
HMCDSD5A1680	1410	1075	346	739	1148	829	1097	851	1149	966
HMCDSD5A1690	684	660	805	862	831	1219	1073	1256	1309	929
HMCDSD5A1700	792	1601	974	1153	1083	909	1047	680	745	598
HMCDSD5A1710	719	572	733	584	747	597	1207	945	1694	1716
HMCDSD5A1720	1213	1390	1251	533	429	856	299	619	618	1062
HMCDSD5A1730	595	785	373	738	874	658	781	864	639	664
HMCDSD5A1740	1141	589	827	957	1027	780	894	1013	812	839
HMCDSD5A1750	568	-9999								
HMCDSD5B1629	829									
HMCDSD5B1630	968	820	1091	1188	1671	1483	1601	1586	1257	1126
HMCDSD5B1640	758	1317	1805	1659	1819	1527	1655	1059	1170	1296
HMCDSD5B1650	2358	1454	1755	1468	1834	2026	868	471	1313	1361
HMCDSD5B1660	1327	1788	2097	1707	1654	2429	1237	2542	2448	1819
HMCDSD5B1670	2324	1773	1606	1676	1139	1768	1070	1100	2271	1650
HMCDSD5B1680	2283	1690	1928	2054	1827	1708	1917	1016	930	892
HMCDSD5B1690	1192	1311	1260	876	1717	1293	1525	1462	1651	2191
HMCDSD5B1700	1494	1606	1751	1894	1733	1804	1553	1240	972	811
HMCDSD5B1710	1319	919	760	618	662	988	1482	1002	1567	1445
HMCDSD5B1720	1241	297	495	205	304	772	445	517	812	-9999
HMCDSD7A1674	2328	1371	1516	1953	2406	1426				
HMCDSD7A1680	1793	1568	2206	2594	1854	1815	1993	527	1182	1944
HMCDSD7A1690	2598	1637	1437	1727	2239	1680	1651	1573	1090	1211
HMCDSD7A1700	1640	1258	934	1252	835	1023	1067	534	557	798
HMCDSD7A1710	835	795	899	510	636	690	1299	1062	1001	941
HMCDSD7A1720	892	789	1009	741	537	405	218	616	659	980
HMCDSD7A1730	406	778	374	688	700	860	989	876	536	675
HMCDSD7A1740	623	583	770	517	694	603	697	563	677	564
HMCDSD7A1750	410	594	418	696	417	0	559	424	880	548
HMCDSD7A1760	484	598	940	646	519	638	667	974	718	652
HMCDSD7A1770	644	869	667	445	652	702	700	0	689	532
HMCDSD7A1780	911	798	1164	901	840	645	791	728	800	618
HMCDSD7A1790	326	239	304	267	319	526	607	457	400	297
HMCDSD7A1800	377	231	416	-9999						
HMCDSE4A1640	724	452	662	580	596	588	1110	944	882	1056
HMCDSE4A1650	1374	1634	1276	1130	902	1052	306	284	384	302
HMCDSE4A1660	868	1304	1228	876	924	1050	634	1416	1350	1134
HMCDSE4A1670	1216	594	672	944	1010	314	374	596	764	870
HMCDSE4A1680	1110	1678	1634	1406	1100	930	1378	874	984	902
HMCDSE4A1690	1330	1608	1626	1122	1100	1456	1488	1232	1538	2096
HMCDSE4A1700	1796	1662	1568	1708	1274	1880	1794	1326	1624	1662
HMCDSE4A1710	1450	1240	1064	1104	1120	1628	1582	1312	1776	1778
HMCDSE4A1720	1818	1700	1672	1566	1566	1390	1018	1104	1182	1332
HMCDSE4A1730	518	900	722	1028	1186	1186	1712	1234	476	654
HMCDSE4A1740	600	1188	1450	1062	1430	886	614	732	876	1118
HMCDSE4A1750	1298	776	1224	706	550	0	762	648	570	644

HMCDSE4A1760	504	664	692	850	1038	1100	872	1338	924	760
HMCDSE4A1770	668	854	836	772	842	578	816	0	444	1040
HMCDSE4A1780	596	676	676	962	428	254	218	294	396	496
HMCDSE4A1790	516	872	928	906	982	1334	1220	826	1208	836
HMCDSE4A1800	894	802	740	1162	1160	-9999				
HMCDSE4B1640	1076	866	896	912	1192	1204	1360	1166	1220	1434
HMCDSE4B1650	1464	2050	1508	1390	936	174	276	126	222	350
HMCDSE4B1660	580	842	982	738	660	852	548	1172	1142	734
HMCDSE4B1670	966	468	798	886	894	598	738	816	872	1002
HMCDSE4B1680	1072	558	1074	1440	1060	864	1452	724	756	816
HMCDSE4B1690	958	1018	1078	870	1132	1248	1238	1212	1064	1004
HMCDSE4B1700	666	702	1156	1734	1214	1288	1560	1248	1166	1128
HMCDSE4B1710	1542	1472	1586	1042	998	1108	1334	1554	1732	1368
HMCDSE4B1720	926	1384	1692	1064	1544	1516	1582	2420	1866	2356
HMCDSE4B1730	716	1288	1234	1484	1380	1014	1388	1540	398	664
HMCDSE4B1740	662	974	1024	1032	1182	1012	1048	832	1314	1128
HMCDSE4B1750	1592	1226	1970	1302	990	0	1340	1464	1412	970
HMCDSE4B1760	1156	1222	1124	1154	1334	970	1420	1022	1166	578
HMCDSE4B1770	1036	1130	970	1314	1368	1100	890	0	1010	1292
HMCDSE4B1780	788	996	1000	516	314	364	414	578	666	706
HMCDSE4B1790	780	672	860	804	1248	990	836	1112	1054	1250
HMCDSE4B1800	724	930	894	1512	1026	1048	736	1082	838	1032
HMCDSE4B1810	1246	-9999								
HMCDSF4A1627	197	433	889							
HMCDSF4A1630	561	703	940	745	312	512	302	293	259	1047
HMCDSF4A1640	234	415	925	878	884	957	697	1026	1083	979
HMCDSF4A1650	1147	882	850	631	867	808	476	0	672	1458
HMCDSF4A1660	1171	1599	1618	1351	1259	1541	1013	1591	1278	1257
HMCDSF4A1670	1438	940	750	1234	1146	1413	1220	1100	1630	2142
HMCDSF4A1680	1626	1242	1151	1360	849	749	1367	1016	765	874
HMCDSF4A1690	1200	1091	1415	1200	1205	1764	1157	1466	1296	1598
HMCDSF4A1700	1485	1146	1461	1700	1347	1452	1600	1304	997	1242
HMCDSF4A1710	1274	1140	795	904	949	868	1529	1989	1822	2153
HMCDSF4A1720	1180	883	1293	1288	1077	1427	1355	732	1814	1161
HMCDSF4A1730	1091	615	567	901	732	592	1101	1084	604	1192
HMCDSF4A1740	1123	882	830	917	1066	754	1223	917	900	417
HMCDSF4A1750	683	822	607	765	539	627	837	1103	921	936
HMCDSF4A1760	753	904	946	708	1127	951	1297	1284	1057	1695
HMCDSF4A1770	1314	1542	1496	1830	1068	993	858	539	540	830
HMCDSF4A1780	639	882	578	617	569	586	513	488	735	857
HMCDSF4A1790	650	816	390	616	464	739	776	562	920	527
HMCDSF4A1800	900	821	906	763	-9999					
HMCDSF4B1621	181	187	255	117	196	541	318	300	143	
HMCDSF4B1630	211	238	251	304	300	151	230	181	255	155
HMCDSF4B1640	185	152	144	296	445	660	909	635	574	803
HMCDSF4B1650	1122	770	561	637	408	362	310	157	501	720
HMCDSF4B1660	1012	1388	1676	1221	1396	1342	981	1937	1745	1505
HMCDSF4B1670	1895	1462	1244	1340	1583	1914	1714	1619	2038	1937
HMCDSF4B1680	2672	1642	1960	969	773	977	1462	1049	800	1080
HMCDSF4B1690	1105	927	925	703	1059	812	939	1377	1677	1188
HMCDSF4B1700	1308	1584	1340	1188	1203	1396	1347	1166	1006	981
HMCDSF4B1710	1339	959	747	624	929	842	971	1136	1421	982
HMCDSF4B1720	536	665	626	745	970	776	592	767	618	812
HMCDSF4B1730	391	397	325	431	319	385	581	481	476	922
HMCDSF4B1740	558	1043	704	994	763	618	739	465	211	355
HMCDSF4B1750	279	414	360	556	551	0	678	649	447	470
HMCDSF4B1760	399	495	466	465	635	610	702	800	996	1100

HMCDSF4B1770	598	458	702	413	551	311	308	0	367	486
HMCDSF4B1780	432	585	-9999							
HMCDSG6B1658	624	1254								
HMCDSG6B1660	638	1244	944	1262	1618	1692	1058	1176	1168	1410
HMCDSG6B1670	1192	900	734	996	1022	1008	1354	1586	1402	1398
HMCDSG6B1680	1430	1524	1444	1772	1286	758	1228	594	778	820
HMCDSG6B1690	1380	1312	1348	1392	1422	1580	1530	1186	1340	1172
HMCDSG6B1700	1154	1404	1308	1094	1180	862	880	408	722	836
HMCDSG6B1710	904	514	902	0	768	754	1102	1284	1098	1194
HMCDSG6B1720	946	1062	710	884	896	796	1010	962	1270	626
HMCDSG6B1730	0	1156	1128	698	1012	692	960	760	764	1118
HMCDSG6B1740	882	826	760	774	792	738	690	964	1110	1136
HMCDSG6B1750	816	1050	1070	654	1086	0	916	1074	1306	858
HMCDSG6B1760	710	604	772	646	1150	832	838	806	1092	1004
HMCDSG6B1770	1052	-9999								
HMDDBO1A1728	2940	1288								
HMDDBO1A1730	1882	1716	1950	2356	3654	2778	2636	2960	2230	1830
HMDDBO1A1740	3002	2402	2882	3202	1790	2010	2658	3324	3338	2886
HMDDBO1A1750	3448	3948	3808	3524	3768	2556	3600	3484	2220	3272
HMDDBO1A1760	2926	3378	1946	2362	2720	2414	2602	3362	2656	2792
HMDDBO1A1770	2388	2052	2354	2230	2466	2232	1618	1532	2752	1810
HMDDBO1A1780	2894	2582	1934	1628	1808	1692	1866	1880	1704	1648
HMDDBO1A1790	1546	1038	958	1226	1068	1310	1666	1106	1578	1168
HMDDBO1A1800	1318	1410	1540	1386	1354	768	890	1016	972	972
HMDDBO1A1810	746	-9999								
HMDDBO1B1728	3562	1518								
HMDDBO1B1730	2228	2098	2074	2142	2112	2780	2944	2980	2060	1730
HMDDBO1B1740	2474	2078	2416	2618	1226	2156	2294	2730	2342	2392
HMDDBO1B1750	3206	3558	3202	3346	2822	1980	2896	2740	1832	2608
HMDDBO1B1760	2386	2156	1578	1762	1696	1626	2388	2362	1632	2062
HMDDBO1B1770	1950	2034	1740	2114	1620	1314	1482	1188	1516	1164
HMDDBO1B1780	1448	1728	1522	1426	1484	2024	1612	1296	1606	1306
HMDDBO1B1790	1462	1186	950	1582	1010	850	1250	642	924	-9999

APPENDIX 2. Output from the quality control program COFECHA.

QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

File of DATED series: hope.txt

CONTENTS:

RUN CONTROL OPTIONS SELECTED		VALUE
1	Cubic smoothing spline 50% wavelength cutoff for filtering	32 years
2	Segments examined are	50 years lagged successively by 25 years
3	Autoregressive model applied	A Residuals are used in master dating series and testing
4	Series transformed to logarithms	Y Each series log-transformed for master dating series and testing
5	CORRELATION is Pearson (parametric, quantitative) Critical correlation, 99% confidence level	.3281
6	Master dating series saved	N
7	Ring measurements listed	N
8	Parts printed	1234567
9	Absent rings are omitted from master series and segment correlations	(Y)

Time span of Master dating series is 1597 to 2003   407 years
Continuous time span is   1597 to 2003   407 years
Portion with two or more series is   1597 to 2003   407 years

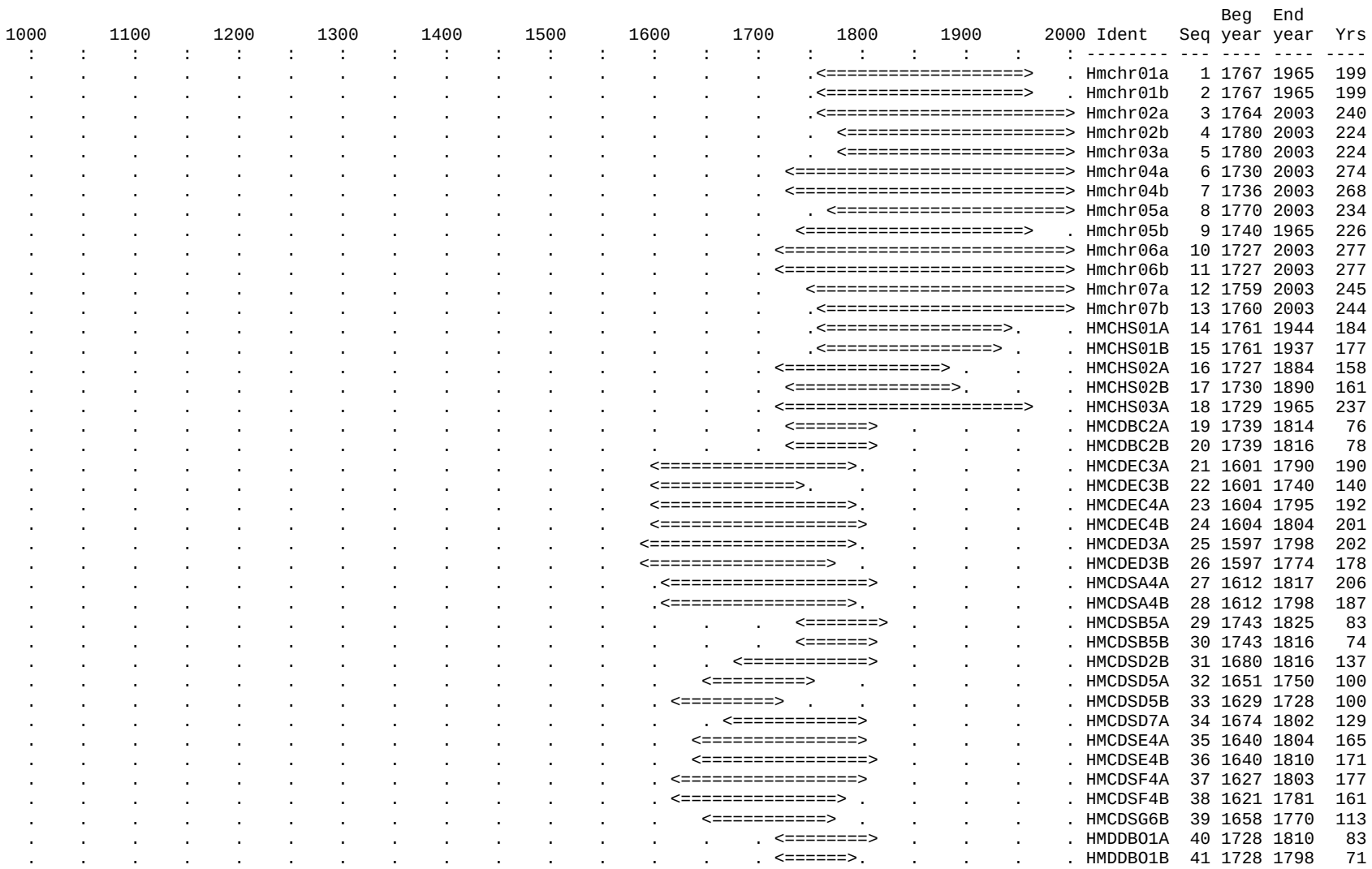
```
*************************************
*C* Number of dated series        41 *C*
*O* Master series 1597 2003  407 yrs *O*
*F* Total rings in all series   7262 *F*
*E* Total dated rings checked   7262 *E*
*C* Series intercorrelation     .513 *C*
*H* Average mean sensitivity    .286 *H*
*A* Segments, possible problems   47 *A*
*** Mean length of series      177.1 ***
*************************************
```

ABSENT RINGS listed by SERIES: (See Master Dating Series for absent rings listed by year)

Hmchr01a	1 absent rings:	1777	
Hmchr01b	2 absent rings:	1777	1787
Hmchr03a	1 absent rings:	1787	
HMCDEC3A	1 absent rings:	1777	
HMCDEC4A	2 absent rings:	1755	1777

```
HMCDEC4B    2 absent rings:   1755  1777
HMCDSA4A    1 absent rings:   1777
HMCDSA4B    1 absent rings:   1777
HMCDSD7A    2 absent rings:   1755  1777
HMCDSE4A    2 absent rings:   1755  1777
HMCDSE4B    2 absent rings:   1755  1777
HMCDSF4A    1 absent rings:   1657
HMCDSF4B    2 absent rings:   1755  1777
HMCDSG6B    3 absent rings:   1713  1730  1755

           23 absent rings    .317%
```



Ident	Seq	Beg year	End year	Yrs
Hmchr01a	1	1767	1965	199
Hmchr01b	2	1767	1965	199
Hmchr02a	3	1764	2003	240
Hmchr02b	4	1780	2003	224
Hmchr03a	5	1780	2003	224
Hmchr04a	6	1730	2003	274
Hmchr04b	7	1736	2003	268
Hmchr05a	8	1770	2003	234
Hmchr05b	9	1740	1965	226
Hmchr06a	10	1727	2003	277
Hmchr06b	11	1727	2003	277
Hmchr07a	12	1759	2003	245
Hmchr07b	13	1760	2003	244
HMCHS01A	14	1761	1944	184
HMCHS01B	15	1761	1937	177
HMCHS02A	16	1727	1884	158
HMCHS02B	17	1730	1890	161
HMCHS03A	18	1729	1965	237
HMCDBC2A	19	1739	1814	76
HMCDBC2B	20	1739	1816	78
HMCDEC3A	21	1601	1790	190
HMCDEC3B	22	1601	1740	140
HMCDEC4A	23	1604	1795	192
HMCDEC4B	24	1604	1804	201
HMCDED3A	25	1597	1798	202
HMCDED3B	26	1597	1774	178
HMCDSA4A	27	1612	1817	206
HMCDSA4B	28	1612	1798	187
HMCDSB5A	29	1743	1825	83
HMCDSB5B	30	1743	1816	74
HMCDSD2B	31	1680	1816	137
HMCDSD5A	32	1651	1750	100
HMCDSD5B	33	1629	1728	100
HMCDSD7A	34	1674	1802	129
HMCDSE4A	35	1640	1804	165
HMCDSE4B	36	1640	1810	171
HMCDSF4A	37	1627	1803	177
HMCDSF4B	38	1621	1781	161
HMCDSG6B	39	1658	1770	113
HMDDBO1A	40	1728	1810	83
HMDDBO1B	41	1728	1798	71

Year	Value	No Ab	Year	Value	No Ab	Year	Value	No Ab	Year	Value	No Ab	Year	Value	No Ab	Year	Value	No Ab
												1600	1.179	2	1650	1.845	13
												1601	-.103	4	1651	1.590	14
												1602	.813	4	1652	.164	14
												1603	-1.360	4	1653	-.057	14
												1604	.225	6	1654	-.275	14
												1605	2.257	6	1655	-.873	14
												1606	-1.864	6	1656	-1.723	14
												1607	-.981	6	1657	-4.073	14 1
												1608	-.654	6	1658	-1.518	15
												1609	.114	6	1659	-.537	15
												1610	-.605	6	1660	-.504	15
												1611	-.711	6	1661	1.092	15
												1612	-.326	8	1662	1.417	15
												1613	1.139	8	1663	.138	15
												1614	.769	8	1664	.191	15
												1615	.639	8	1665	1.438	15
												1616	.448	8	1666	-.771	15
												1617	.712	8	1667	1.852	15
												1618	-.038	8	1668	1.018	15
												1619	.658	8	1669	.573	15
												1620	-1.206	8	1670	1.373	15
												1621	-.350	9	1671	-1.013	15
												1622	1.313	9	1672	-1.572	15
												1623	1.478	9	1673	-.558	15
												1624	-1.409	9	1674	-.214	16
												1625	.784	9	1675	-.631	16
												1626	1.178	9	1676	-1.531	16
												1627	-.979	10	1677	-.388	16
												1628	-1.139	10	1678	.770	16
												1629	-.990	11	1679	.776	16
												1630	-.774	11	1680	1.404	17
												1631	.161	11	1681	-.240	17
												1632	.623	11	1682	.851	17
												1633	-1.184	11	1683	1.532	17
												1634	-.281	11	1684	.051	17
												1635	-.575	11	1685	-.304	17
												1636	1.047	11	1686	.743	17
												1637	-.641	11	1687	-1.661	17
												1638	-1.712	11	1688	-1.341	17
												1639	.847	11	1689	-.913	17
												1640	-1.096	13	1690	-.314	17
												1641	-.363	13	1691	-.945	17
												1642	-.004	13	1692	-.368	17
												1643	-.212	13	1693	-1.053	17
												1644	1.138	13	1694	-.520	17
												1645	.226	13	1695	.748	17
												1646	1.203	13	1696	.148	17
						1597	-.049	2				1647	.751	13	1697	.632	17
						1598	1.569	2				1648	.739	13	1698	.353	17
						1599	.879	2				1649	.936	13	1699	.385	17

Year	Value	No	Ab	Year	Value	No	Ab	Year	Value	No	Ab	Year	Value	No	Ab	Year	Value	No	Ab
1700	-.188	17		1750	.393	29		1800	-.177	30		1850	1.625	18		1900	-.288	16		1950	-.093	14	
1701	.385	17		1751	.746	28		1801	-.417	30		1851	1.156	18		1901	.763	16		1951	.220	14	
1702	.486	17		1752	.173	28		1802	.188	30		1852	1.711	18		1902	-.054	16		1952	.069	14	
1703	.798	17		1753	.561	28		1803	-1.639	29		1853	-.087	18		1903	1.404	16		1953	1.095	14	
1704	.550	17		1754	-.301	28		1804	-.370	28		1854	-.250	18		1904	-.545	16		1954	-.469	14	
1705	.920	17		1755	-2.466	28	7	1805	-.551	26		1855	-.135	18		1905	-.377	16		1955	1.173	14	
1706	1.018	17		1756	.911	28		1806	1.093	26		1856	-1.593	18		1906	-.841	16		1956	1.163	14	
1707	-.879	17		1757	.568	28		1807	-.156	26		1857	1.472	18		1907	.355	16		1957	1.087	14	
1708	-.828	17		1758	-.041	28		1808	-.352	26		1858	.155	18		1908	2.058	16		1958	-.335	14	
1709	-.097	17		1759	.338	29		1809	.433	26		1859	.563	18		1909	1.644	16		1959	-.004	14	
1710	.464	17		1760	-1.354	30		1810	-.319	26		1860	-.617	18		1910	-.760	16		1960	-1.710	14	
1711	-.393	17		1761	.120	32		1811	-1.246	24		1861	-.379	18		1911	-.670	16		1961	.491	14	
1712	-.694	17		1762	-.440	32		1812	.558	24		1862	1.387	18		1912	.479	16		1962	-.016	14	
1713	-1.827	17	1	1763	-.209	32		1813	-1.460	24		1863	.824	18		1913	.143	16		1963	.140	14	
1714	-.556	17		1764	.673	33		1814	.043	24		1864	-.594	18		1914	-.793	16		1964	1.069	14	
1715	.113	17		1765	-.353	33		1815	1.051	23		1865	-.619	18		1915	.334	16		1965	-.931	14	
1716	1.393	17		1766	.509	33		1816	1.198	23		1866	-.008	18		1916	-.402	16		1966	-1.074	10	
1717	.658	17		1767	.504	35		1817	1.981	20		1867	.045	18		1917	1.178	16		1967	-.462	10	
1718	1.581	17		1768	.357	35		1818	-1.253	19		1868	-.968	18		1918	.299	16		1968	-2.685	10	
1719	1.311	17		1769	.894	35		1819	.423	19		1869	-.227	18		1919	.588	16		1969	-.510	10	
1720	.266	17		1770	.677	36		1820	1.682	19		1870	.893	18		1920	-1.344	16		1970	.323	10	
1721	-.259	17		1771	.412	35		1821	-.275	19		1871	.449	18		1921	-2.237	16		1971	.515	10	
1722	.310	17		1772	-.027	35		1822	.387	19		1872	-.358	18		1922	-2.167	16		1972	.548	10	
1723	-.607	17		1773	.929	35		1823	1.068	19		1873	.643	18		1923	-.880	16		1973	1.445	10	
1724	-.457	17		1774	.652	35		1824	-.579	19		1874	.028	18		1924	.774	16		1974	1.552	10	
1725	.391	17		1775	.224	34		1825	-.435	19		1875	-.185	18		1925	.483	16		1975	1.515	10	
1726	-1.335	17		1776	-.394	34		1826	-2.371	18		1876	-.859	18		1926	-.321	16		1976	-.078	10	
1727	.617	20		1777	-4.179	34	11	1827	.141	18		1877	.191	18		1927	-2.169	16		1977	-1.864	10	
1728	-.223	22		1778	-.016	34		1828	-.263	18		1878	.179	18		1928	.544	16		1978	-1.297	10	
1729	.101	22		1779	-.947	34		1829	-.488	18		1879	-2.701	18		1929	1.699	16		1979	.157	10	
1730	-1.420	24	1	1780	.305	36		1830	-1.349	18		1880	-2.061	18		1930	.499	16		1980	.341	10	
1731	-.145	24		1781	1.351	36		1831	-.134	18		1881	.968	18		1931	1.162	16		1981	.691	10	
1732	-.578	24		1782	-.116	35		1832	.245	18		1882	1.375	18		1932	-.356	16		1982	1.523	10	
1733	-.330	24		1783	.016	35		1833	-.957	18		1883	-.036	18		1933	1.409	16		1983	-.802	10	
1734	.467	24		1784	.204	35		1834	3.061	18		1884	1.218	18		1934	-.624	16		1984	.929	10	
1735	-.147	24		1785	-.538	35		1835	.368	18		1885	-.296	17		1935	.476	16		1985	-1.565	10	
1736	.704	25		1786	-.062	35		1836	-1.136	18		1886	.838	17		1936	1.427	16		1986	-1.612	10	
1737	1.276	25		1787	-.773	35	2	1837	-2.232	18		1887	-.423	17		1937	-.336	16		1987	-.940	10	
1738	-.423	25		1788	.196	35		1838	.357	18		1888	-.502	17		1938	1.087	15		1988	1.184	10	
1739	-.116	27		1789	-.390	35		1839	.565	18		1889	1.160	17		1939	1.000	15		1989	2.047	10	
1740	.059	28		1790	.278	35		1840	.449	18		1890	1.359	17		1940	-.236	15		1990	.288	10	
1741	-.298	27		1791	.358	34		1841	.530	18		1891	-.662	16		1941	1.289	15		1991	-.555	10	
1742	-.254	27		1792	-1.227	34		1842	1.338	18		1892	-1.027	16		1942	-.492	15		1992	-1.230	10	
1743	.177	29		1793	.709	34		1843	.465	18		1893	-.985	16		1943	-1.706	15		1993	.154	10	
1744	.172	29		1794	-.069	34		1844	-1.120	18		1894	-1.259	16		1944	-.579	15		1994	1.289	10	
1745	-.211	29		1795	1.084	34		1845	-1.748	18		1895	-1.666	16		1945	-1.510	14		1995	-2.332	10	
1746	.187	29		1796	1.340	33		1846	-.148	18		1896	.075	16		1946	-1.180	14		1996	-.028	10	
1747	.452	29		1797	-.217	33		1847	-.398	18		1897	-.314	16		1947	-.012	14		1997	.694	10	
1748	-.197	29		1798	.877	33		1848	-1.788	18		1898	.586	16		1948	-.866	14		1998	1.250	10	
1749	-.623	29		1799	-.090	30		1849	.183	18		1899	.546	16		1949	-1.799	14		1999	-1.114	10	

Year	Value	No Ab	Year	Value	No Ab	Year	Value	No Ab	Year	Value	No Ab	Year	Value	No Ab	Year	Value	No Ab
2000	.864	10															
2001	1.131	10															
2002	-1.578	10															
2003	.384	10															

Year	Rel value	Year	Rel value	Year	Rel value	Year	Rel value	Year	Rel value	Year	Rel value	Year	Rel value	Year	Rel value

```
1597-----@
1598----------F
1599--------D
```

```
  Year Rel value  Year Rel value  Year Rel value  Year Rel value  Year Rel value  Year Rel value  Year Rel value  Year Rel value
  1600---------E  1650----------G 1700----a       1750-------B    1800----a       1850----------G 1900----a       1950----@
  1601----@       1651----------F 1701-------B    1751--------C   1801---b        1851---------E  1901--------C   1951------A
  1602--------C   1652------A     1702-------B    1752------A     1802------A     1852----------G 1902-----@      1952-----@
  1603-e          1653-----@      1703--------C   1753-------B    1803g           1853-----@      1903----------F 1953---------D
  1604------A     1654----a       1704-------B    1754---a        1804---a        1854----a       1904--b         1954---b
  1605----------I 1655-c          1705--------D   1755j           1805--b         1855----a       1905---b        1955---------E
  1606g           1656g           1706---------D  1756--------D   1806---------D  1856f           1906--c         1956---------E
  1607-d          1657p           1707-d          1757-------B    1807----a       1857----------F 1907------A     1957---------D
  1608--c         1658f           1708--c         1758-----@      1808---a        1858------A     1908----------H 1958---a
  1609-----@      1659--b         1709----@       1759------A     1809-------B    1859-------B    1909----------G 1959-----@
  1610--b         1660--b         1710-------B    1760-e          1810---a        1860--b         1910--c         1960g
  1611--c         1661---------D  1711---b        1761-----@      1811-e          1861---b        1911--c         1961-------B
  1612---a        1662----------F 1712--c         1762---b        1812-------B    1862----------F 1912-------B    1962-----@
  1613---------E  1663-----A      1713g           1763----a       1813f           1863--------C   1913-----A      1963-----A
  1614--------C   1664------A     1714--b         1764--------C   1814-----@      1864--b         1914--c         1964---------D
  1615--------C   1665----------F 1715-----@       1765---a        1815---------D  1865--b         1915------A     1965-d
  1616-------B    1666--c         1716----------F 1766-------B    1816---------E  1866-----@      1916--b         1966-d
  1617--------C   1667----------G 1717--------C   1767-------B    1817----------H 1867-----@      1917---------E  1967---b
  1618-----@      1668---------D  1718----------F 1768------A     1818-e          1868-d          1918------A     1968k
  1619--------C   1669-------B    1719---------E  1769--------D   1819-------B    1869----a       1919-------B    1969--b
  1620-e          1670----------E 1720------A     1770--------C   1820----------G 1870--------D   1920-e          1970------A
  1621---a        1671-d          1721----a       1771-------B    1821----a       1871-------B    1921i           1971-------B
  1622---------E  1672f           1722------A     1772-----@      1822-------B    1872---a        1922i           1972-------B
  1623----------F 1673--b         1723--b         1773--------D   1823---------D  1873--------C   1923-d          1973----------F
  1624-f          1674----a       1724---b        1774--------C   1824--b         1874-----@      1924--------C   1974----------F
  1625--------C   1675--c         1725-------B    1775------A     1825---b        1875----a       1925-------B    1975----------F
  1626---------E  1676f           1726-e          1776---b        1826i           1876--c         1926---a        1976-----@
  1627-d          1677---b        1727-------B    1777q           1827-----A      1877------A     1927i           1977g
  1628-e          1678--------C   1728----a       1778-----@      1828----a       1878------A     1928-------B    1978-e
  1629-d          1679--------C   1729-----@      1779-d          1829---b        1879k           1929----------G 1979------A
  1630--c         1680----------F 1730f           1780------A     1830-e          1880h           1930-------B    1980------A
  1631------A     1681----a       1731----a       1781----------E 1831----a       1881---------D  1931---------E  1981--------C
  1632-------B    1682--------C   1732--b         1782----@       1832------A     1882----------E 1932---a        1982----------F
  1633-e          1683----------F 1733---a        1783-----@      1833-d          1883-----@      1933----------F 1983--c
  1634----a       1684-----@      1734-------B    1784------A     1834----------L 1884---------E  1934--b         1984--------D
  1635--b         1685---a        1735----a       1785--b         1835------A     1885---a        1935-------B    1985f
  1636---------D  1686--------C   1736--------C   1786-----@      1836-e          1886--------C   1936----------F 1986f
  1637--c         1687g           1737---------E  1787--c         1837i           1887---b        1937---a        1987-d
  1638g           1688-e          1738---b        1788------A     1838------A     1888--b         1938---------D  1988---------E
  1639--------C   1689-d          1739----@       1789---b        1839-------B    1889---------E  1939---------D  1989----------H
  1640-d          1690---a        1740-----@      1790------A     1840-------B    1890----------E 1940----a       1990------A
  1641---a        1691-d          1741---a        1791------A     1841-------B    1891--c         1941---------E  1991--b
  1642-----@      1692---a        1742----a       1792-e          1842----------E 1892-d          1942---b        1992-e
  1643----a       1693-d          1743------A     1793--------C   1843-------B    1893-d          1943g           1993------A
  1644---------E  1694--b         1744------A     1794-----@      1844-d          1894-e          1944--b         1994---------E
  1645------A     1695--------C   1745----a       1795---------D  1845g           1895g           1945f           1995i
  1646---------E  1696------A     1746------A     1796----------E 1846----a       1896-----@      1946-e          1996-----@
  1647--------C   1697--------C   1747-------B    1797----a       1847---b        1897---a        1947-----@      1997--------C
  1648--------C   1698------A     1748----a       1798--------D   1848g           1898-------B    1948-c          1998---------E
  1649--------D   1699-------B    1749--b         1799-----@      1849------A     1899-------B    1949g           1999-d
```

```
  Year Rel value  Year Rel value  Year Rel value  Year Rel value  Year Rel value  Year Rel value  Year Rel value  Year Rel value
  2000--------C
  2001---------E
  2002f
  2003-------B
```

Correlations of 50-year dated segments, lagged 25 years
Flags: A = correlation under .3281 but highest as dated; B = correlation higher at other than dated position

Seq	Series	Time_span	1575 1624	1600 1649	1625 1674	1650 1699	1675 1724	1700 1749	1725 1774	1750 1799	1775 1824	1800 1849	1825 1874	1850 1899	1875 1924	1900 1949	1925 1974	1950 1999	1975 2024
1	Hmchr01a	1767 1965								.32A	.42	.53	.41	.28A	.45	.57	.44		
2	Hmchr01b	1767 1965								.42	.64	.64	.45	.42	.56	.49	.41		
3	Hmchr02a	1764 2003								.46	.56	.66	.54	.66	.62	.52	.46	.53	.55
4	Hmchr02b	1780 2003									.45	.57	.56	.62	.63	.55	.55	.52	.52
5	Hmchr03a	1780 2003									.31B	.55	.57	.28B	.30A	.43	.49	.49	.54
6	Hmchr04a	1730 2003							.32B	.55	.53	.59	.61	.45	.50	.67	.59	.63	.62
7	Hmchr04b	1736 2003							.69	.74	.79	.79	.68	.64	.57	.52	.55	.62	.66
8	Hmchr05a	1770 2003								.84	.83	.78	.67	.64	.68	.65	.39	.30A	.35
9	Hmchr05b	1740 1965							.57	.62	.68	.73	.62	.43	.44	.56	.53		
10	Hmchr06a	1727 2003							.35	.63	.63	.54	.42	.37	.37	.43	.55	.61	.66
11	Hmchr06b	1727 2003							.43	.76	.77	.71	.59	.49	.58	.72	.73	.72	.73
12	Hmchr07a	1759 2003								.63	.63	.60	.60	.47	.44	.50	.58	.72	.81
13	Hmchr07b	1760 2003								.47	.65	.76	.58	.47	.49	.47	.56	.72	.75
14	HMCHS01A	1761 1944								.47	.63	.56	.36	.41	.43	.42			
15	HMCHS01B	1761 1937								.59	.77	.68	.44	.17B	.31B	.53			
16	HMCHS02A	1727 1884							.16B	.22B	.25B	.59	.66	.70					
17	HMCHS02B	1730 1890							.36B	.42B	.54	.65	.62	.66					
18	HMCHS03A	1729 1965							.35	.58	.49	.53	.62	.62	.58	.46	.50		
19	HMCDBC2A	1739 1814							.39	.48	.48								
20	HMCDBC2B	1739 1816							.45	.53	.46								
21	HMCDEC3A	1601 1790		.66	.62	.53	.32A	.13B	.07B	.11B									
22	HMCDEC3B	1601 1740		.63	.55	.41	.16B	.14B											
23	HMCDEC4A	1604 1795		.48	.53	.40	.15B	.23B	.32A	.17B									
24	HMCDEC4B	1604 1804		.49	.56	.48	.26B	.31B	.29B	.15B	.14B								
25	HMCDED3A	1597 1798	.42	.45	.65	.59	.44	.48	.52	.58									
26	HMCDED3B	1597 1774	.55	.59	.68	.56	.45	.54	.36										
27	HMCDSA4A	1612 1817		.38	.43	.57	.46	.47	.19B	.23A	.51								
28	HMCDSA4B	1612 1798		.63	.76	.75	.66	.54	.29A	.37									
29	HMCDSB5A	1743 1825							.63	.66	.40	.40							
30	HMCDSB5B	1743 1816							.51	.64	.55								
31	HMCDSD2B	1680 1816					.52	.41	.39	.41	.36								
32	HMCDSD5A	1651 1750				.47	.23B	.54	.43										
33	HMCDSD5B	1629 1728			.54	.68	.66	.60											
34	HMCDSD7A	1674 1802				.50	.51	.54	.24B	.05B	.08B								
35	HMCDSE4A	1640 1804			.55	.55	.36	.41	.38	.18B	.11B								
36	HMCDSE4B	1640 1810			.67	.69	.48	.35	.33	-.01B	-.27B								
37	HMCDSF4A	1627 1803			.54	.63	.51	.25B	.26A	.52	.51								
38	HMCDSF4B	1621 1781		.56	.56	.58	.34	.35	.32A	.20B									
39	HMCDSG6B	1658 1770				.47	.45	.18B	-.04B										
40	HMDDBO1A	1728 1810							.33	.46	.35								
41	HMDDBO1B	1728 1798							.33A	.52									
Av segment correlation			.48	.54	.59	.55	.41	.38	.35	.44	.47	.62	.56	.49	.50	.53	.52	.59	.62

For each series with potential problems the following diagnostics may appear:

[A] Correlations with master dating series of flagged 50-year segments of series filtered with 32-year spline,
at every point from ten years earlier (-10) to ten years later (+10) than dated

[B] Effect of those data values which most lower or raise correlation with master series

[C] Year-to-year changes very different from the mean change in other series

[D] Absent rings (zero values)

[E] Values which are statistical outliers from mean for the year

Hmchr01a 1767 to 1965 199 years Series 1

[A] Segment	High	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
1767 1816	0	.06	.14	.24	-.17	.00	-.25	-.06	.00	.17	.24	.32*	-.01	.09	-.20	.05	.04	.05	.06	-.14	-.08	-.04
1850 1899	0	-.04	.16	.14	-.07	-.01	-.27	-.03	.00	-.23	-.17	.28*	.03	.16	-.17	.10	.04	-.14	-.01	.19	.06	.02

[B] Entire series, effect on correlation (.457) is:

Lower	1864	-.018	1867	-.018	1965	-.013	1826	-.011	Higher	1777	.039	1834	.018	1921	.011	1837	.010		
1767 to 1816 segment:																			
Lower	1813	-.060	1792	-.031	1797	-.027	1778	-.025	Higher	1777	.237	1803	.027	1796	.016	1795	.012		
1850 to 1899 segment:																			
Lower	1867	-.048	1880	-.027	1895	-.025	1864	-.022	Higher	1884	.030	1852	.030	1850	.018	1882	.017		

[D] 1 Absent rings: Year Master N series Absent
1777 -4.179 34 11

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year
1864 -4.6 SD; 1867 -4.9 SD

Hmchr01b 1767 to 1965 199 years Series 2

[B] Entire series, effect on correlation (.483) is:

Lower	1879	-.022	1949	-.019	1767	-.019	1945	-.013	Higher	1777	.013	1908	.011	1818	.009	1922	.008		

[C] Year-to-year changes diverging by over 4.0 std deviations:
1948 1949 -4.7 SD

[D] 2 Absent rings: Year Master N series Absent
1777 -4.179 34 11
1787 -.773 35 2

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year
1949 -6.3 SD

Hmchr02a 1764 to 2003 240 years Series 3

[B] Entire series, effect on correlation (.547) is:

```
      Lower   1920  -.011   1868  -.010   2002  -.008   1845  -.008  Higher   1879   .016   1995   .015   1834   .010   1921   .008

================================================================================================================================================

Hmchr02b  1780 to  2003     224 years                                                                                          Series   4

[B] Entire series, effect on correlation (  .542) is:
      Lower   1968  -.011   1920  -.009   1817  -.008   1930  -.007  Higher   1879   .020   1927   .008   1834   .007   1848   .006

[E] Outliers     1   3.0 SD above or -4.5 SD below mean for year
      1818 -5.3 SD
================================================================================================================================================

Hmchr03a  1780 to  2003     224 years                                                                                          Series   5

[A] Segment   High   -10   -9   -8   -7   -6   -5   -4   -3   -2   -1   +0   +1   +2   +3   +4   +5   +6   +7   +8   +9  +10
   ---------  ----   ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---
   1780 1829    3    .14 -.04  .12 -.17 -.02 -.15 -.15  .11 -.10  .01  .31|-.02  .02  .32* .01  .26  .01 -.17 -.06 -.21 -.15
   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
   1850 1899   -8   -.14 -.23  .31*-.10 -.17 -.03  .19  .12 -.03 -.07  .28| .21 -.38 -.02 -.07  .00 -.12 -.03  .16  .08 -.06
   1875 1924    0   -.16 -.08 -.02  .00  .07 -.01  .07 -.13  .00 -.12  .30* .11 -.11 -.16  .00 -.06 -.18  .10 -.02  .03  .05

[B] Entire series, effect on correlation (  .420) is:
      Lower   1882  -.013   1865  -.011   1884  -.009   1807  -.008  Higher   1834   .018   1848   .008   2002   .007   1989   .007
    1780 to 1829 segment:
      Lower   1798  -.038   1807  -.030   1797  -.028   1795  -.026  Higher   1817   .040   1826   .038   1796   .032   1820   .030
    1850 to 1899 segment:
      Lower   1882  -.059   1865  -.051   1884  -.041   1894  -.029  Higher   1891   .045   1880   .028   1889   .028   1852   .027
    1875 to 1924 segment:
      Lower   1882  -.043   1884  -.030   1894  -.022   1921  -.018  Higher   1920   .043   1891   .028   1889   .023   1890   .019

[D]    1 Absent rings:  Year   Master  N series Absent
                        1787    -.773      35       2

[E] Outliers     1   3.0 SD above or -4.5 SD below mean for year
      1865 +3.2 SD
================================================================================================================================================

Hmchr04a  1730 to  2003     274 years                                                                                          Series   6

[A] Segment   High   -10   -9   -8   -7   -6   -5   -4   -3   -2   -1   +0   +1   +2   +3   +4   +5   +6   +7   +8   +9  +10
   ---------  ----   ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---
   1730 1779    5   -.10 -.31 -.03 -.01 -.27  .09 -.17 -.06  .25 -.02  .32|-.11 -.02  .18 -.24  .38* .06 -.04  .04  .01 -.15

[B] Entire series, effect on correlation (  .519) is:
      Lower   1743  -.011   1879  -.009   1922  -.008   1774  -.007  Higher   1755   .010   1834   .008   1995   .008   1777   .007
    1730 to 1779 segment:
      Lower   1743  -.037   1730  -.032   1774  -.029   1746  -.024  Higher   1755   .078   1777   .062   1760   .033   1779   .014

================================================================================================================================================

Hmchr04b  1736 to  2003     268 years                                                                                          Series   7

[B] Entire series, effect on correlation (  .637) is:
      Lower   1747  -.007   1742  -.007   1904  -.007   1974  -.006  Higher   1777   .030   1834   .009   1879   .009   1995   .007

[E] Outliers     1   3.0 SD above or -4.5 SD below mean for year
      1777 -5.1 SD
```

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==========================================================================================================================

Hmchr05a  1770 to  2003     234 years                                                                        Series   8

[A] Segment   High   -10   -9   -8   -7   -6   -5   -4   -3   -2   -1   +0   +1   +2   +3   +4   +5   +6   +7   +8   +9  +10
   ---------  ----   ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---
   1950 1999    0    .08  .11  .08 -.04 -.10  .26 -.14  .03  .04  .01  .30* .04 -.18 -.24 -.16    -    -    -    -    -    -

[B] Entire series, effect on correlation (  .610) is:
      Lower   1954  -.020   1955  -.012   1990  -.011   1958  -.010  Higher   1777   .032   1879   .010   1826   .008   1921   .007
    1950 to 1999 segment:
      Lower   1955  -.037   1958  -.035   1954  -.035   1992  -.028  Higher   1968   .048   1965   .022   1986   .022   1974   .022

==========================================================================================================================

Hmchr05b  1740 to  1965     226 years                                                                        Series   9

[B] Entire series, effect on correlation (  .535) is:
      Lower   1746  -.017   1891  -.011   1956  -.010   1884  -.010  Higher   1777   .042   1879   .022   1834   .010   1826   .010

==========================================================================================================================

Hmchr06a  1727 to  2003     277 years                                                                        Series  10

[B] Entire series, effect on correlation (  .504) is:
      Lower   1924  -.017   1796  -.015   1860  -.008   1879  -.007  Higher   1777   .040   1968   .013   1834   .010   1960   .006

==========================================================================================================================

Hmchr06b  1727 to  2003     277 years                                                                        Series  11

[B] Entire series, effect on correlation (  .642) is:
      Lower   1733  -.014   1891  -.009   1742  -.007   1748  -.005  Higher   1777   .025   1968   .012   1995   .009   1927   .006

==========================================================================================================================

Hmchr07a  1759 to  2003     245 years                                                                        Series  12

[B] Entire series, effect on correlation (  .598) is:
      Lower   1950  -.014   1922  -.013   1943  -.008   1892  -.006  Higher   1777   .020   1968   .015   1995   .012   1908   .007

==========================================================================================================================

Hmchr07b  1760 to  2003     244 years                                                                        Series  13

[B] Entire series, effect on correlation (  .579) is:
      Lower   1872  -.012   1919  -.009   1879  -.009   1941  -.007  Higher   1968   .015   1995   .008   1813   .005   1977   .005

==========================================================================================================================

HMCHS01A  1761 to  1944     184 years                                                                        Series  14

[B] Entire series, effect on correlation (  .449) is:
      Lower   1868  -.021   1937  -.013   1844  -.010   1766  -.009  Higher   1834   .025   1777   .014   1927   .010   1803   .008

[E] Outliers     1   3.0 SD above or -4.5 SD below mean for year
      1868 -5.4 SD
==========================================================================================================================
```

HMCHS01B 1761 to 1937 177 years Series 15

[A] Segment	High	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
1850 1899	8	.01	-.08	.13	.08	-.07	-.05	.17	.18	-.10	-.18	.17|	-.14	-.15	-.06	-.08	.06	-.09	.30	.50*	.20	-.12
1875 1924	7	-.08	.13	.14	.01	.04	-.02	.23	-.14	-.17	-.16	.31|	.04	.01	-.09	-.14	.05	.20	.38*	-.01	.14	-.03

[B] Entire series, effect on correlation (.493) is:

Lower	1871	-.043	1879	-.020	1902	-.014	1884	-.011	Higher	1777	.030	1834	.020	1826	.016	1818	.009					
1850 to 1899 segment:																						
Lower	1871	-.109	1879	-.042	1884	-.032	1886	-.025	Higher	1895	.043	1862	.040	1856	.036	1894	.026					
1875 to 1924 segment:																						
Lower	1879	-.052	1902	-.046	1884	-.042	1886	-.034	Higher	1908	.045	1920	.039	1895	.031	1917	.027					

HMCHS02A 1727 to 1884 158 years Series 16

[A] Segment	High	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
1727 1776	5	.02	-.16	-.06	.01	.08	.23	-.21	.06	.17	-.17	.16|	-.13	-.16	.20	-.06	.24*	-.10	-.23	-.06	-.07	-.05
1750 1799	-5	-.16	-.19	-.16	.15	.26	.53*	-.19	-.02	.04	-.31	.22|	-.11	-.19	.30	-.09	.23	-.06	-.16	.04	-.08	.10
1775 1824	-6	-.10	-.09	.00	.00	.25*	.14	-.14	.13	-.24	-.07	.25|	-.26	.01	.10	-.05	.20	-.23	.18	.07	-.10	.08

[B] Entire series, effect on correlation (.419) is:

Lower	1814	-.017	1730	-.015	1792	-.010	1757	-.010	Higher	1879	.047	1834	.018	1837	.015	1813	.012					
1727 to 1776 segment:																						
Lower	1730	-.060	1751	-.035	1757	-.031	1735	-.022	Higher	1760	.122	1756	.038	1738	.017	1737	.017					
1750 to 1799 segment:																						
Lower	1792	-.028	1787	-.027	1751	-.023	1757	-.023	Higher	1760	.063	1777	.040	1756	.024	1795	.017					
1775 to 1824 segment:																						
Lower	1814	-.044	1792	-.025	1787	-.024	1798	-.021	Higher	1813	.044	1820	.043	1777	.035	1817	.026					

HMCHS02B 1730 to 1890 161 years Series 17

[A] Segment	High	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
1730 1779	-8	.01	-.05	.37*	-.36	-.01	.24	-.31	.22	-.02	-.21	.36|	.08	.17	-.19	-.28	.02	-.09	-.04	.09	-.04	-.17
1750 1799	-8	.13	.17	.57*	-.19	-.08	.11	-.32	.14	-.01	-.19	.42|	.04	.18	-.14	-.24	-.06	-.06	.08	-.11	-.01	-.24

[B] Entire series, effect on correlation (.534) is:

Lower	1763	-.025	1881	-.020	1864	-.015	1786	-.014	Higher	1879	.033	1803	.011	1817	.007	1756	.007					
1730 to 1779 segment:																						
Lower	1763	-.064	1747	-.025	1757	-.021	1768	-.017	Higher	1756	.040	1760	.022	1737	.019	1773	.016					
1750 to 1799 segment:																						
Lower	1763	-.054	1786	-.033	1777	-.019	1757	-.017	Higher	1756	.028	1760	.020	1796	.018	1795	.015					

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year
1786 -4.6 SD

HMCHS03A 1729 to 1965 237 years Series 18

[B] Entire series, effect on correlation (.512) is:

Lower	1903	-.015	1747	-.013	1920	-.011	1818	-.010	Higher	1879	.025	1921	.009	1834	.009	1908	.006					

```
HMCDBC2A  1739 to  1814      76 years                                                                                                    Series  19

[B] Entire series, effect on correlation (  .511) is:
      Lower   1777  -.057   1767  -.020   1782  -.018   1783  -.017  Higher   1755   .038   1803   .030   1792   .023   1813   .023
```

```
HMCDBC2B  1739 to  1816      78 years                                                                                                    Series  20

[B] Entire series, effect on correlation (  .498) is:
      Lower   1777  -.057   1767  -.034   1749  -.017   1801  -.010  Higher   1755   .075   1813   .027   1792   .024   1781   .013
```

```
HMCDEC3A  1601 to  1790     190 years                                                                                                    Series  21

[A] Segment   High   -10   -9   -8   -7   -6   -5   -4   -3   -2   -1   +0   +1   +2   +3   +4   +5   +6   +7   +8   +9  +10
   ---------  ----   ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---
   1675 1724    0   -.07 -.23 -.08 -.35 -.06 -.09 -.13  .06  .08  .09  .32* .08  .23  .29  .07 -.15 -.05 -.19 -.03 -.05 -.20
   1700 1749    3   -.22 -.02 -.19 -.24 -.24 -.17 -.05  .01  .09  .14  .13| .01  .17  .29* .15  .02  .03 -.19 -.17 -.07 -.12
   1725 1774    5   -.21  .02 -.22 -.07 -.29 -.13  .03 -.13  .06  .01  .07|-.08 -.13  .13  .12  .33* .05 -.12  .18 -.12  .19
   1741 1790    5   -.22 -.05  .01  .06 -.11  .09 -.11  .02  .25 -.14  .11|-.23 -.26  .14  .05  .27* .10 -.08  .23 -.08  .25

[B] Entire series, effect on correlation (  .493) is:
      Lower   1699  -.014   1769  -.012   1707  -.012   1619  -.012  Higher   1777   .085   1606   .020   1687   .011   1605   .010
    1675 to 1724 segment:
      Lower   1699  -.065   1707  -.057   1710  -.048   1705  -.042  Higher   1687   .094   1718   .046   1676   .029   1680   .026
    1700 to 1749 segment:
      Lower   1707  -.055   1738  -.046   1710  -.041   1725  -.040  Higher   1726   .071   1718   .066   1749   .031   1736   .024
    1725 to 1774 segment:
      Lower   1769  -.045   1738  -.043   1750  -.035   1725  -.035  Higher   1726   .073   1755   .070   1749   .033   1756   .029
    1741 to 1790 segment:
      Lower   1769  -.036   1760  -.034   1750  -.030   1787  -.022  Higher   1777   .427   1779   .009   1749   .006   1756   .006

[D]    1 Absent rings:  Year   Master  N series Absent
                        1777   -4.179      34      11
```

```
HMCDEC3B  1601 to  1740     140 years                                                                                                    Series  22

[A] Segment   High   -10   -9   -8   -7   -6   -5   -4   -3   -2   -1   +0   +1   +2   +3   +4   +5   +6   +7   +8   +9  +10
   ---------  ----   ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---
   1675 1724   -3    .00 -.22 -.32 -.40 -.16 -.03  .02  .20* .06  .18  .16| .18  .20  .07 -.10 -.19 -.02 -.16  .07 -.01 -.19
   1691 1740    2    .06 -.14 -.23 -.23 -.09 -.04  .02  .02  .04 -.05  .14| .06  .25* .06 -.02 -.14 -.12 -.05  .13  .15 -.16

[B] Entire series, effect on correlation (  .433) is:
      Lower   1668  -.024   1619  -.019   1699  -.017   1638  -.015  Higher   1624   .016   1730   .015   1606   .014   1603   .012
    1675 to 1724 segment:
      Lower   1699  -.037   1707  -.036   1706  -.027   1690  -.024  Higher   1676   .046   1680   .033   1716   .029   1683   .020
    1691 to 1740 segment:
      Lower   1707  -.038   1699  -.037   1706  -.029   1693  -.024  Higher   1730   .121   1726   .036   1716   .031   1718   .017
```

HMCDEC4A 1604 to 1795 192 years Series 23

[A] Segment	High	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
1675 1724	2	.01	-.06	-.27	-.03	-.05	-.04	.01	-.10	.12	.23	.15|	.30	.39*	-.05	-.01	.03	.00	-.01	-.30	-.26	-.16
1700 1749	2	.01	.08	-.07	.00	.04	.05	-.20	-.11	-.03	-.07	.23|	.09	.40*	.07	-.01	.03	.08	-.11	-.13	.11	-.10
1725 1774	0	-.04	-.07	-.08	.19	-.05	.26	-.12	.27	.21	-.14	.32*	-.05	.02	.12	-.01	-.20	-.09	-.15	-.26	-.07	.14
1746 1795	3	-.09	-.02	-.09	.21	.15	.17	.16	-.08	.00	-.16	.17|	.15	-.01	.25*	-.06	-.14	-.05	-.14	-.21	-.20	.08

[B] Entire series, effect on correlation (.451) is:

Lower	1686	-.012	1781	-.010	1694	-.009	1729	-.009	Higher	1777	.051	1755	.034	1606	.010	1667	.008					
1675 to 1724 segment:																						
Lower	1686	-.053	1706	-.029	1694	-.018	1718	-.018	Higher	1716	.061	1682	.025	1679	.015	1707	.014					
1700 to 1749 segment:																						
Lower	1729	-.044	1706	-.038	1718	-.027	1705	-.022	Higher	1716	.069	1730	.048	1726	.027	1727	.023					
1725 to 1774 segment:																						
Lower	1729	-.036	1739	-.018	1767	-.016	1741	-.014	Higher	1755	.238	1727	.010	1769	.010	1730	.007					
1746 to 1795 segment:																						
Lower	1781	-.038	1779	-.032	1792	-.031	1787	-.017	Higher	1777	.126	1755	.093	1795	.014	1769	.006					

[D] 2 Absent rings:

Year	Master	N series	Absent
1755	-2.466	28	7
1777	-4.179	34	11

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1619 +3.4 SD; 1638 -4.7 SD; 1755 -4.7 SD

==========

HMCDEC4B 1604 to 1804 201 years Series 24

[A] Segment	High	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
1675 1724	2	.11	-.13	-.18	-.08	-.11	-.07	.10	-.10	.20	.19	.26|	.30	.33*	-.09	-.17	-.05	-.01	-.10	-.37	-.12	-.12
1700 1749	2	-.11	-.08	.08	.09	.09	.02	.11	-.05	.24	.00	.31|-	.13	.42*	-.15	-.18	-.14	-.12	-.03	-.19	.05	.08
1725 1774	2	-.21	-.02	.04	.01	.04	.08	.21	.10	.16	.01	.29|-	.03	.40*	-.02	-.07	-.17	-.26	-.08	-.16	.01	.06
1750 1799	2	-.08	-.06	.11	.19	.18	.13	-.02	-.05	-.12	-.05	.15|	.13	.23*	.04	-.10	-.04	-.14	-.09	-.06	.03	-.13
1755 1804	-6	-.10	-.08	.04	.23	.27*	.14	.00	.00	-.05	-.08	.14|	.06	.10	.02	.11	-.12	-.17	-.07	-.06	.09	-.15

[B] Entire series, effect on correlation (.485) is:

Lower	1728	-.011	1686	-.010	1619	-.008	1698	-.007	Higher	1777	.063	1755	.028	1657	.017	1624	.007					
1675 to 1724 segment:																						
Lower	1686	-.060	1698	-.040	1693	-.019	1715	-.019	Higher	1716	.054	1687	.040	1713	.019	1682	.019					
1700 to 1749 segment:																						
Lower	1728	-.040	1749	-.032	1718	-.026	1738	-.021	Higher	1716	.053	1730	.045	1737	.041	1727	.021					
1725 to 1774 segment:																						
Lower	1728	-.039	1749	-.033	1760	-.030	1738	-.023	Higher	1755	.220	1737	.024	1730	.017	1727	.012					
1750 to 1799 segment:																						
Lower	1760	-.024	1795	-.020	1792	-.018	1765	-.017	Higher	1777	.203	1755	.080	1756	.007	1781	.006					
1755 to 1804 segment:																						
Lower	1760	-.021	1795	-.020	1783	-.018	1801	-.018	Higher	1777	.209	1755	.078	1756	.007	1781	.007					

[D] 2 Absent rings:

Year	Master	N series	Absent
1755	-2.466	28	7
1777	-4.179	34	11

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1619 +3.6 SD; 1638 -5.7 SD

==========

```
HMCDED3A  1597 to  1798     202 years                                                                                    Series  25

[B] Entire series, effect on correlation (  .516) is:
      Lower   1696  -.018   1603  -.016   1627  -.014   1795  -.010  Higher   1657   .035   1606   .020   1777   .018   1605   .009

================================================================================================================================

HMCDED3B  1597 to  1774     178 years                                                                                    Series  26

[B] Entire series, effect on correlation (  .498) is:
      Lower   1773  -.024   1764  -.021   1641  -.015   1599  -.012  Higher   1657   .029   1606   .017   1667   .010   1755   .010

================================================================================================================================

HMCDSA4A  1612 to  1817     206 years                                                                                    Series  27

[A] Segment   High   -10   -9   -8   -7   -6   -5   -4   -3   -2   -1   +0   +1   +2   +3   +4   +5   +6   +7   +8   +9  +10
   ---------  ----   ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---
   1725 1774    4   -.19  .10 -.15 -.05  .08  .03 -.02 -.08  .13 -.27  .19| .16  .10  .08 .34*-.11  .21  .07 -.35 -.09  .01
   1750 1799    0    .03  .01 -.13  .00 -.10  .09 -.34  .05  .06 -.19  .23* .02  .14  .11  .12  .05  .04 -.11 -.06 -.03 -.02

[B] Entire series, effect on correlation (  .477) is:
      Lower   1687  -.018   1638  -.015   1755  -.014   1626  -.010  Higher   1777   .062   1803   .012   1792   .009   1726   .008
    1725 to 1774 segment:
      Lower   1755  -.062   1751  -.027   1773  -.026   1774  -.025  Higher   1726   .094   1749   .025   1730   .020   1769   .016
    1750 to 1799 segment:
      Lower   1755  -.068   1774  -.023   1751  -.023   1773  -.022  Higher   1777   .329   1792   .027   1781   .017   1796   .016

[D]    1 Absent rings:  Year   Master  N series Absent
                        1777   -4.179      34      11

[E] Outliers     2   3.0 SD above or -4.5 SD below mean for year
      1624 -4.5 SD;    1638 +3.4 SD
================================================================================================================================

HMCDSA4B  1612 to  1798     187 years                                                                                    Series  28

[A] Segment   High   -10   -9   -8   -7   -6   -5   -4   -3   -2   -1   +0   +1   +2   +3   +4   +5   +6   +7   +8   +9  +10
   ---------  ----   ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---
   1725 1774    0   -.12  .20 -.28  .06 -.04  .09  .10 -.16  .18 -.28  .29*-.05 -.03  .28 -.01  .07  .11 -.08 -.06 -.14  .08

[B] Entire series, effect on correlation (  .609) is:
      Lower   1735  -.015   1774  -.015   1624  -.012   1630  -.007  Higher   1777   .065   1657   .015   1792   .006   1687   .006
    1725 to 1774 segment:
      Lower   1774  -.053   1735  -.027   1765  -.024   1751  -.018  Higher   1726   .050   1730   .044   1749   .024   1756   .023

[D]    1 Absent rings:  Year   Master  N series Absent
                        1777   -4.179      34      11

[E] Outliers     1   3.0 SD above or -4.5 SD below mean for year
      1777 -4.7 SD
================================================================================================================================

HMCDSB5A  1743 to  1825      83 years                                                                                    Series  29

[B] Entire series, effect on correlation (  .440) is:
      Lower   1820  -.037   1818  -.031   1811  -.026   1817  -.020  Higher   1777   .157   1755   .076   1760   .019   1823   .009
```

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==========================================================================================================================================

HMCDSB5B  1743 to  1816      74 years                                                                                      Series  30

[B] Entire series, effect on correlation (  .474) is:
      Lower   1749  -.070   1792  -.028   1811  -.016   1784  -.012  Higher   1777   .104   1755   .070   1795   .010   1796   .010

==========================================================================================================================================

HMCDSD2B  1680 to  1816     137 years                                                                                      Series  31

[B] Entire series, effect on correlation (  .414) is:
      Lower   1780  -.025   1813  -.025   1756  -.016   1749  -.012  Higher   1687   .031   1777   .029   1755   .020   1713   .015

==========================================================================================================================================

HMCDSD5A  1651 to  1750     100 years                                                                                      Series  32

[A] Segment   High   -10   -9   -8   -7   -6   -5   -4   -3   -2   -1   +0   +1   +2   +3   +4   +5   +6   +7   +8   +9  +10
   ---------  ----   ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---
   1675 1724    2    .05 -.12 -.27 -.17  .12 -.14 -.08  .04  .07  .22  .23|-.10  .25* .02 -.07  .17  .11 -.09 -.05 -.05 -.23

[B] Entire series, effect on correlation (  .459) is:
      Lower   1682  -.110   1750  -.036   1688  -.017   1683  -.013  Higher   1657   .122   1726   .014   1718   .012   1666   .011
    1675 to 1724 segment:
      Lower   1682  -.264   1688  -.034   1683  -.025   1721  -.015  Higher   1718   .041   1719   .023   1676   .023   1680   .023

[C] Year-to-year changes diverging by over 4.0 std deviations:
      1681 1682  -4.5 SD

[E] Outliers     1   3.0 SD above or -4.5 SD below mean for year
      1682 -5.6 SD
==========================================================================================================================================

HMCDSD5B  1629 to  1728     100 years                                                                                      Series  33

[B] Entire series, effect on correlation (  .564) is:
      Lower   1647  -.018   1651  -.015   1631  -.015   1637  -.014  Higher   1657   .069   1687   .019   1676   .012   1667   .012

==========================================================================================================================================

HMCDSD7A  1674 to  1802     129 years                                                                                      Series  34

[A] Segment   High   -10   -9   -8   -7   -6   -5   -4   -3   -2   -1   +0   +1   +2   +3   +4   +5   +6   +7   +8   +9  +10
   ---------  ----   ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---
   1725 1774   -2   -.03 -.03 -.03 -.41  .03  .01 -.03 -.21  .26*-.10  .24| .03 -.09  .15  .14  .08  .01 -.09  .13 -.12 -.13
   1750 1799   -2   -.04 -.06  .11 -.17  .01 -.04 -.11 -.22  .21* .00  .05| .04 -.15  .07  .04 -.08 -.03 -.09  .09 -.03 -.06
   1753 1802   -2   -.09  .01  .05 -.12  .02 -.08 -.07 -.26  .23*-.02  .08| .02 -.10 -.01  .15 -.23  .02 -.05  .02  .00 -.07

[B] Entire series, effect on correlation (  .584) is:
      Lower   1773  -.016   1762  -.013   1793  -.011   1679  -.011  Higher   1777   .127   1755   .046   1687   .021   1726   .010
    1725 to 1774 segment:
      Lower   1773  -.045   1762  -.037   1758  -.020   1725  -.020  Higher   1755   .269   1726   .035   1730   .021   1736   .011
    1750 to 1799 segment:
      Lower   1773  -.027   1762  -.026   1782  -.022   1793  -.018  Higher   1777   .243   1755   .077   1796   .006   1753   .002
    1753 to 1802 segment:
      Lower   1773  -.030   1762  -.025   1782  -.021   1793  -.020  Higher   1777   .236   1755   .073   1796   .005   1753   .002
```

```
[D]    2 Absent rings:  Year   Master  N series Absent
                        1755   -2.466      28       7
                        1777   -4.179      34      11

[E] Outliers     1   3.0 SD above or -4.5 SD below mean for year
      1755 -5.2 SD
================================================================================================================================

HMCDSE4A  1640 to  1804     165 years                                                                              Series  35

[A] Segment   High   -10   -9   -8   -7   -6   -5   -4   -3   -2   -1   +0   +1   +2   +3   +4   +5   +6   +7   +8   +9  +10
   ---------  ----   ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---
   1750 1799    2    .16  .08  .22  .08 -.18  .17 -.23  .07 -.15 -.10  .18| .06  .31*-.09  .15 -.09 -.02  .14 -.07 -.09 -.33
   1755 1804    2    .23  .07  .25  .09 -.27  .15 -.26  .10 -.16 -.07  .11| .01  .36* .07  .03 -.01 -.05  .05 -.03 -.12 -.30

[B] Entire series, effect on correlation (  .513) is:
      Lower   1803  -.022   1779  -.015   1681  -.013   1640  -.011  Higher   1777   .092   1755   .036   1730   .011   1656   .009
    1750 to 1799 segment:
      Lower   1779  -.046   1792  -.034   1765  -.016   1751  -.013  Higher   1777   .207   1755   .069   1795   .007   1756   .006
    1755 to 1804 segment:
      Lower   1803  -.064   1779  -.041   1792  -.030   1765  -.014  Higher   1777   .225   1755   .073   1795   .009   1756   .008

[D]    2 Absent rings:  Year   Master  N series Absent
                        1755   -2.466      28       7
                        1777   -4.179      34      11

[E] Outliers     1   3.0 SD above or -4.5 SD below mean for year
      1755 -5.7 SD
================================================================================================================================

HMCDSE4B  1640 to  1810     171 years                                                                              Series  36

[A] Segment   High   -10   -9   -8   -7   -6   -5   -4   -3   -2   -1   +0   +1   +2   +3   +4   +5   +6   +7   +8   +9  +10
   ---------  ----   ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---
   1750 1799   -7    .09  .20  .13  .25* .14 -.02  .13 -.13 -.20 -.02 -.01| .24 -.04 -.13 -.15 -.12 -.04  .09  .23 -.12 -.02
   1761 1810   -7    .00  .17  .21  .21* .04  .01 -.02  .10 -.27  .13 -.27| .11  .01  .10 -.22  .12 -.16  .16  .11 -.17  .04

[B] Entire series, effect on correlation (  .449) is:
      Lower   1803  -.035   1806  -.020   1769  -.019   1779  -.010  Higher   1777   .060   1755   .045   1730   .012   1687   .010
    1750 to 1799 segment:
      Lower   1769  -.052   1779  -.029   1792  -.026   1760  -.018  Higher   1777   .140   1755   .123   1756   .008   1773   .006
    1761 to 1810 segment:
      Lower   1803  -.112   1806  -.067   1769  -.062   1779  -.032  Higher   1777   .477   1781   .016   1773   .014   1785   .013

[D]    2 Absent rings:  Year   Master  N series Absent
                        1755   -2.466      28       7
                        1777   -4.179      34      11

[E] Outliers     2   3.0 SD above or -4.5 SD below mean for year
      1755 -6.6 SD;    1803 +3.6 SD
================================================================================================================================

HMCDSF4A  1627 to  1803     177 years                                                                              Series  37

[A] Segment   High   -10   -9   -8   -7   -6   -5   -4   -3   -2   -1   +0   +1   +2   +3   +4   +5   +6   +7   +8   +9  +10
   ---------  ----   ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---
   1700 1749   -1   -.02 -.07  .19  .04 -.06  .02 -.03  .09 -.07  .38* .25| .08 -.25  .04 -.22 -.16  .22 -.25 -.06 -.07  .00
```

```
   1725 1774    0    .14 -.05  .21 -.03  .08  .22 -.11  .23 -.17  .11  .26* .08 -.22  .09 -.24 -.09  .11 -.12 -.05 -.01 -.04

[B] Entire series, effect on correlation (  .510) is:
      Lower   1727  -.013   1636  -.013   1629  -.011   1728  -.011  Higher   1657   .064   1792   .009   1777   .007   1672   .007
    1700 to 1749 segment:
      Lower   1727  -.051   1728  -.041   1726  -.040   1730  -.028  Higher   1719   .029   1718   .024   1749   .024   1716   .021
    1725 to 1774 segment:
      Lower   1727  -.047   1728  -.038   1726  -.038   1730  -.026  Higher   1760   .032   1773   .025   1755   .024   1749   .023

[D]    1 Absent rings:  Year   Master  N series Absent
                        1657   -4.073      14       1

================================================================================================================================================

HMCDSF4B  1621 to  1781     161 years                                                                                          Series  38

[A] Segment   High   -10   -9   -8   -7   -6   -5   -4   -3   -2   -1   +0   +1   +2   +3   +4   +5   +6   +7   +8   +9  +10
   ---------  ----   ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---
   1725 1774    0    .13 -.03  .06  .03  .04  .17  .10  .00  .16 -.25  .32*-.01  .01 -.12  .06 -.02  .03  .20 -.13 -.18 -.03
   1732 1781    7    .19 -.09  .14 -.03  .04  .16 -.11  .09 -.07 -.24  .20| .13  .12 -.07  .06 -.05  .05  .25*-.22 -.18 -.02

[B] Entire series, effect on correlation (  .517) is:
      Lower   1683  -.029   1639  -.014   1633  -.013   1695  -.011  Higher   1777   .041   1755   .029   1657   .010   1624   .010
    1725 to 1774 segment:
      Lower   1741  -.030   1773  -.028   1737  -.026   1734  -.020  Higher   1755   .245   1730   .026   1756   .024   1769   .012
    1732 to 1781 segment:
      Lower   1741  -.024   1773  -.021   1779  -.020   1737  -.018  Higher   1755   .107   1777   .065   1756   .017   1781   .009

[D]    2 Absent rings:  Year   Master  N series Absent
                        1755   -2.466      28       7
                        1777   -4.179      34      11

[E] Outliers     1   3.0 SD above or -4.5 SD below mean for year
      1755 -5.2 SD
================================================================================================================================================

HMCDSG6B  1658 to  1770     113 years                                                                                          Series  39

[A] Segment   High   -10   -9   -8   -7   -6   -5   -4   -3   -2   -1   +0   +1   +2   +3   +4   +5   +6   +7   +8   +9  +10
   ---------  ----   ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---
   1700 1749    1   -.19 -.05 -.24  .07 -.25 -.10 -.20  .14 -.13 -.07  .18| .27* .14  .09  .09 -.01  .14 -.27  .00 -.11 -.10
   1721 1770   -5   -.10 -.12 -.04  .07 -.07  .17*-.14  .07 -.09  .07 -.04| .07  .02 -.03 -.08  .12 -.13 -.21 -.09 -.05  .13

[B] Entire series, effect on correlation (  .491) is:
      Lower   1676  -.019   1726  -.019   1693  -.012   1662  -.011  Higher   1755   .070   1730   .029   1687   .023   1713   .021
    1700 to 1749 segment:
      Lower   1726  -.053   1749  -.025   1737  -.023   1728  -.021  Higher   1730   .101   1713   .099   1707   .035   1719   .009
    1721 to 1770 segment:
      Lower   1726  -.050   1737  -.025   1749  -.023   1728  -.020  Higher   1755   .227   1730   .091   1764   .009   1751   .006

[D]    3 Absent rings:  Year   Master  N series Absent
                        1713   -1.827      17       1
                        1730   -1.420      24       1
                        1755   -2.466      28       7

[E] Outliers     2   3.0 SD above or -4.5 SD below mean for year
      1713 -5.0 SD;    1730 -5.2 SD
================================================================================================================================================
```

```
HMDDBO1A  1728 to  1810      83 years                                                                                    Series  40

[B] Entire series, effect on correlation (  .313) is:
      Lower   1803  -.034   1744  -.028   1791  -.022   1762  -.015  Higher   1777   .043   1792   .025   1755   .021   1781   .014

=================================================================================================================================

HMDDBO1B  1728 to  1798      71 years                                                                                    Series  41

[A] Segment   High   -10   -9   -8   -7   -6   -5   -4   -3   -2   -1   +0   +1   +2   +3   +4   +5   +6   +7   +8   +9  +10
   ---------  ----   ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---  ---
   1728 1777    0    .02  .09 -.09 -.20  .07 -.11 -.11  .28 -.15  .05  .33* .09  .06 -.04 -.17  .02 -.19 -.09 -.09  .01  .01

[B] Entire series, effect on correlation (  .348) is:
      Lower   1744  -.106   1785  -.034   1795  -.022   1728  -.017  Higher   1777   .068   1755   .018   1779   .014   1792   .013
    1728 to 1777 segment:
      Lower   1744  -.153   1728  -.021   1729  -.018   1760  -.018  Higher   1777   .098   1755   .024   1737   .018   1756   .015

[E] Outliers     2   3.0 SD above or -4.5 SD below mean for year
      1744 -4.7 SD;    1785 +3.2 SD
=================================================================================================================================
```

Seq	Series	Interval	No. Years	No. Segmt	No. Flags	Corr with Master	Unfiltered Mean msmt	Unfiltered Max msmt	Unfiltered Std dev	Unfiltered Auto corr	Filtered Mean sens	Filtered Max value	Filtered Std dev	Filtered Auto corr	AR ()
1	Hmchr01a	1767 1965	199	8	2	.457	1.26	3.80	.736	.838	.249	2.75	.394	.011	1
2	Hmchr01b	1767 1965	199	8	0	.483	1.41	4.21	.810	.842	.258	2.66	.326	.004	1
3	Hmchr02a	1764 2003	240	10	0	.547	.93	2.99	.600	.851	.291	2.90	.552	.033	3
4	Hmchr02b	1780 2003	224	9	0	.542	.98	3.63	.700	.850	.265	2.58	.427	.019	2
5	Hmchr03a	1780 2003	224	9	3	.420	1.13	6.03	.831	.711	.356	2.91	.439	-.033	2
6	Hmchr04a	1730 2003	274	11	1	.519	.90	3.00	.483	.761	.289	2.69	.420	-.028	1
7	Hmchr04b	1736 2003	268	11	0	.637	.89	3.07	.569	.811	.278	2.61	.303	-.023	1
8	Hmchr05a	1770 2003	234	10	1	.610	.84	2.59	.504	.813	.257	2.69	.403	.027	1
9	Hmchr05b	1740 1965	226	9	0	.535	.98	2.50	.567	.859	.232	2.66	.430	.032	1
10	Hmchr06a	1727 2003	277	11	0	.504	.77	2.91	.523	.770	.306	2.58	.351	.011	1
11	Hmchr06b	1727 2003	277	11	0	.642	.77	2.49	.497	.722	.344	2.70	.439	.006	1
12	Hmchr07a	1759 2003	245	10	0	.598	.92	3.62	.522	.739	.253	2.78	.411	-.039	1
13	Hmchr07b	1760 2003	244	10	0	.579	1.02	3.10	.616	.792	.264	2.89	.508	.001	1
14	HMCHS01A	1761 1944	184	7	0	.449	1.00	2.44	.412	.596	.262	2.84	.359	.002	2
15	HMCHS01B	1761 1937	177	7	2	.493	1.32	3.56	.584	.632	.294	2.87	.441	.026	1
16	HMCHS02A	1727 1884	158	6	3	.419	1.31	3.48	.669	.510	.417	2.70	.438	.095	1
17	HMCHS02B	1730 1890	161	6	2	.534	1.47	4.21	.752	.589	.357	2.91	.500	.045	1
18	HMCHS03A	1729 1965	237	9	0	.512	1.02	3.83	.706	.751	.336	2.70	.393	-.010	1
19	HMCDBC2A	1739 1814	76	3	0	.511	1.88	3.54	.613	.612	.241	2.51	.435	.008	1
20	HMCDBC2B	1739 1816	78	3	0	.498	2.06	3.97	.911	.805	.226	2.59	.434	.029	2
21	HMCDEC3A	1601 1790	190	7	4	.493	.96	4.07	.893	.944	.280	2.45	.299	-.026	1
22	HMCDEC3B	1601 1740	140	5	2	.433	1.04	3.67	.810	.937	.248	2.81	.587	-.003	1
23	HMCDEC4A	1604 1795	192	7	4	.451	.77	2.86	.361	.482	.326	2.86	.330	.007	1
24	HMCDEC4B	1604 1804	201	8	5	.485	.84	3.47	.420	.485	.331	3.00	.388	.006	1
25	HMCDED3A	1597 1798	202	8	0	.516	.95	3.48	.657	.905	.240	2.82	.492	.025	1
26	HMCDED3B	1597 1774	178	7	0	.498	.87	2.93	.702	.934	.242	2.92	.568	-.002	1
27	HMCDSA4A	1612 1817	206	8	2	.477	.99	3.17	.711	.925	.226	2.52	.362	-.030	1
28	HMCDSA4B	1612 1798	187	7	1	.609	1.13	3.13	.733	.899	.265	2.44	.326	-.004	2
29	HMCDSB5A	1743 1825	83	4	0	.440	1.65	3.62	.651	.661	.292	2.50	.392	-.031	1
30	HMCDSB5B	1743 1816	74	3	0	.474	1.89	3.51	.744	.664	.298	2.38	.380	-.008	1
31	HMCDSD2B	1680 1816	137	5	0	.414	.82	2.42	.380	.738	.234	2.77	.436	-.024	4
32	HMCDSD5A	1651 1750	100	4	1	.459	.96	2.04	.329	.472	.295	2.55	.374	-.001	1
33	HMCDSD5B	1629 1728	100	4	0	.564	1.39	2.54	.516	.590	.279	2.62	.511	.051	1
34	HMCDSD7A	1674 1802	129	6	3	.584	.89	2.60	.537	.780	.340	2.36	.331	.001	1
35	HMCDSE4A	1640 1804	165	7	2	.513	1.01	2.10	.422	.717	.291	2.48	.340	-.020	1
36	HMCDSE4B	1640 1810	171	7	2	.449	1.06	2.42	.391	.524	.298	2.45	.299	-.005	1
37	HMCDSF4A	1627 1803	177	7	2	.510	1.00	2.15	.393	.637	.296	2.55	.362	.015	1
38	HMCDSF4B	1621 1781	161	7	2	.517	.79	2.67	.499	.846	.318	2.66	.304	-.039	1
39	HMCDSG6B	1658 1770	113	4	2	.491	1.01	1.77	.326	.438	.316	2.31	.371	-.050	1
40	HMDDBO1A	1728 1810	83	3	0	.313	2.20	3.95	.840	.748	.203	2.63	.511	.025	1
41	HMDDBO1B	1728 1798	71	2	1	.348	1.97	3.56	.669	.670	.216	2.55	.392	-.037	1
Total or mean:			7262	288	47	.513	1.06	6.03	.594	.745	.286	3.00	.407	.001	

- = [COFECHA HOPE COF] = -

APPENDIX 3. The Hope Mills Tree-Ring Chronology

1597	.8951	1639	1.0893	1681	1.0046	1723	.8484	1765	1.0109
1598	.9876	1640	.8270	1682	1.2310	1724	.8857	1766	1.1955
1599	1.0102	1641	.9621	1683	1.2681	1725	1.0051	1767	1.1992
1600	.9871	1642	1.0310	1684	.9954	1726	.7212	1768	1.1991
1601	.9067	1643	.9849	1685	.9070	1727	1.0230	1769	1.2964
1602	1.0207	1644	1.2273	1686	1.1162	1728	.8660	1770	1.2306
1603	.8047	1645	1.1169	1687	.6960	1729	1.0630	1771	1.1647
1604	.9912	1646	1.2878	1688	.7315	1730	.6493	1772	1.0919
1605	1.3275	1647	1.2064	1689	.7890	1731	.9298	1773	1.2580
1606	.7549	1648	1.2123	1690	.8926	1732	.8438	1774	1.2082
1607	.8072	1649	1.2570	1691	.7975	1733	.8266	1775	1.0954
1608	.8452	1650	1.4791	1692	.8724	1734	1.0290	1776	.9563
1609	.9840	1651	1.4471	1693	.8262	1735	.9007	1777	.3739
1610	.9334	1652	1.1299	1694	.9401	1736	1.0610	1778	.9524
1611	.9263	1653	1.0585	1695	1.0835	1737	1.1948	1779	.8711
1612	.9086	1654	.9974	1696	1.0457	1738	.8658	1780	.9810
1613	.9920	1655	.8664	1697	1.0834	1739	.9034	1781	1.1925
1614	1.0326	1656	.6924	1698	1.0695	1740	.8536	1782	.9455
1615	1.0305	1657	.4245	1699	1.0734	1741	.8557	1783	.9907
1616	1.0108	1658	.7095	1700	.9898	1742	.8514	1784	.9964
1617	1.1300	1659	.9037	1701	1.1099	1743	.9376	1785	.8126
1618	.9127	1660	.9127	1702	1.1055	1744	1.0051	1786	.9108
1619	.8733	1661	1.2717	1703	1.1615	1745	.9096	1787	.7794
1620	.8025	1662	1.3767	1704	1.1152	1746	.9742	1788	.9735
1621	.9561	1663	1.0611	1705	1.1766	1747	.9941	1789	.8946
1622	1.2045	1664	1.0849	1706	1.2166	1748	.9098	1790	.9913
1623	1.2755	1665	1.3810	1707	.9500	1749	.8789	1791	1.0472
1624	.7844	1666	.9121	1708	.8970	1750	1.0282	1792	.8623
1625	1.0452	1667	1.4865	1709	.9861	1751	1.0688	1793	1.0956
1626	1.0996	1668	1.3043	1710	1.1159	1752	.9937	1794	1.0146
1627	.8106	1669	1.1881	1711	.9561	1753	1.0430	1795	1.2240
1628	.7802	1670	1.3357	1712	.9303	1754	.9244	1796	1.2623
1629	.7400	1671	.8583	1713	.7431	1755	.4948	1797	1.0375
1630	.8059	1672	.7908	1714	.9092	1756	1.2141	1798	1.1758
1631	.9292	1673	.9380	1715	.9992	1757	1.1106	1799	.9942
1632	.9912	1674	.9732	1716	1.2864	1758	1.0590	1800	.9651
1633	.7803	1675	.8883	1717	1.1498	1759	1.1004	1801	.9338
1634	.8384	1676	.7241	1718	1.3453	1760	.7969	1802	1.0077
1635	.8273	1677	.9358	1719	1.2274	1761	.9764	1803	.8431
1636	1.0395	1678	1.1573	1720	1.0660	1762	.9491	1804	.9788
1637	.8148	1679	1.1796	1721	.9416	1763	1.0368	1805	.9639
1638	.7734	1680	1.2527	1722	1.0404	1764	1.1918	1806	1.2060

1807	1.0253	1847	.8457	1887	1.0146	1927	.6193	1967	.8978
1808	.9925	1848	.7274	1888	.9835	1928	.9466	1968	.6665
1809	1.1007	1849	.9612	1889	1.2318	1929	1.1929	1969	.9377
1810	1.0316	1850	1.2298	1890	1.3673	1930	.9481	1970	1.1047
1811	.8932	1851	1.1810	1891	.9269	1931	1.0630	1971	1.1990
1812	1.1450	1852	1.2608	1892	.8332	1932	.8201	1972	1.1969
1813	.8491	1853	.9744	1893	.8814	1933	1.0932	1973	1.4934
1814	1.0929	1854	.9455	1894	.8607	1934	.7839	1974	1.5180
1815	1.2750	1855	.9893	1895	.7992	1935	.9464	1975	1.5074
1816	1.3391	1856	.8314	1896	.9841	1936	1.0758	1976	1.1384
1817	1.5456	1857	1.2796	1897	.9946	1937	.8334	1977	.8474
1818	.8876	1858	1.0460	1898	1.1931	1938	1.0623	1978	.8499
1819	1.1257	1859	1.1011	1899	1.1464	1939	1.0040	1979	1.1558
1820	1.4691	1860	.9826	1900	1.0121	1940	.7957	1980	1.2208
1821	1.0174	1861	.9835	1901	1.2343	1941	1.0373	1981	1.2315
1822	1.0922	1862	1.1888	1902	1.0222	1942	.7517	1982	1.4297
1823	1.2037	1863	1.1424	1903	1.4050	1943	.6038	1983	.9447
1824	.8350	1864	1.0089	1904	1.0015	1944	.6953	1984	1.2888
1825	.8621	1865	.9931	1905	1.0602	1945	.5874	1985	.8298
1826	.5713	1866	1.0472	1906	.9407	1946	.6089	1986	.7890
1827	.9636	1867	1.0516	1907	1.1695	1947	.7708	1987	.8545
1828	.8535	1868	.9468	1908	1.4967	1948	.6724	1988	1.3023
1829	.8213	1869	.9833	1909	1.3930	1949	.6109	1989	1.5551
1830	.6829	1870	1.1441	1910	.9278	1950	.8377	1990	1.1743
1831	.8603	1871	1.0897	1911	.9777	1951	.9080	1991	.8844
1832	.9131	1872	.9772	1912	1.1341	1952	.8568	1992	.7571
1833	.7160	1873	1.0801	1913	1.0424	1953	1.0965	1993	.9239
1834	1.5185	1874	.9962	1914	.8512	1954	.8494	1994	1.2840
1835	.9288	1875	.9842	1915	1.0049	1955	1.2163	1995	.6273
1836	.6859	1876	.8946	1916	.8829	1956	1.1804	1996	.9508
1837	.5671	1877	1.0312	1917	1.1860	1957	1.1660	1997	1.1364
1838	.9135	1878	1.0321	1918	.9518	1958	.9137	1998	1.2409
1839	.9363	1879	.7127	1919	.9867	1959	.9632	1999	.7514
1840	.9247	1880	.7751	1920	.7314	1960	.7696	2000	1.0555
1841	.9447	1881	1.2230	1921	.6197	1961	1.1159	2001	1.1208
1842	1.1322	1882	1.3020	1922	.6335	1962	1.0183	2002	.7226
1843	.9330	1883	1.0398	1923	.7547	1963	1.0747	2003	.9998
1844	.7317	1884	1.2949	1924	1.0481	1964	1.2455		
1845	.6622	1885	1.0035	1925	.9265	1965	.9841		
1846	.8492	1886	1.2187	1926	.8071	1966	.7845		

APPENDIX 4. The Weymouth Woods State Park Tree-Ring Chronology

1671	1.1326	1712	1.0418	1753	1.2457	1794	1.0421	1835	.9361
1672	1.0233	1713	.9911	1754	1.0942	1795	1.2952	1836	.8850
1673	.8503	1714	1.1998	1755	.8919	1796	1.0648	1837	.7563
1674	.8906	1715	1.2448	1756	1.0831	1797	.5685	1838	.9456
1675	.8699	1716	.9138	1757	1.5913	1798	.8464	1839	.9851
1676	.7051	1717	.9885	1758	.8593	1799	.7366	1840	.9319
1677	.7975	1718	1.3445	1759	1.0988	1800	.7246	1841	.8341
1678	.8844	1719	1.4247	1760	1.1732	1801	.8355	1842	1.1165
1679	.8956	1720	.7422	1761	1.4043	1802	1.0651	1843	1.0725
1680	.6363	1721	.9313	1762	.9872	1803	1.0052	1844	1.0903
1681	.8039	1722	1.0890	1763	1.2981	1804	.9674	1845	.8890
1682	.8307	1723	1.0448	1764	1.4981	1805	.8201	1846	1.0109
1683	.9973	1724	.6329	1765	1.4822	1806	1.1105	1847	1.1128
1684	.7783	1725	.6937	1766	1.5911	1807	1.1530	1848	.9839
1685	.8088	1726	.9564	1767	1.0595	1808	1.0536	1849	1.1625
1686	.8523	1727	.9148	1768	1.1682	1809	1.2135	1850	1.2339
1687	.6776	1728	1.0456	1769	1.2933	1810	1.1552	1851	1.3499
1688	.9516	1729	1.3402	1770	1.4905	1811	1.0652	1852	1.6206
1689	1.1280	1730	.8481	1771	1.3326	1812	.9872	1853	.9818
1690	1.1539	1731	.9746	1772	1.1663	1813	.7732	1854	1.0279
1691	1.0116	1732	.8087	1773	1.1437	1814	1.0071	1855	1.0521
1692	1.0469	1733	1.0454	1774	.9227	1815	1.0584	1856	1.0162
1693	1.2845	1734	.9032	1775	1.2276	1816	1.0901	1857	1.0949
1694	1.1712	1735	.7805	1776	1.0670	1817	1.1917	1858	.8640
1695	1.0537	1736	1.1557	1777	1.0200	1818	.6949	1859	.9714
1696	1.2422	1737	.9606	1778	1.3132	1819	.8277	1860	.8981
1697	1.2066	1738	.7380	1779	1.0278	1820	.9042	1861	1.0037
1698	1.1398	1739	.9226	1780	.9628	1821	.8352	1862	1.1557
1699	1.0898	1740	1.0669	1781	.9322	1822	.7612	1863	.9426
1700	.8275	1741	.9371	1782	.8489	1823	.9703	1864	1.0720
1701	1.2144	1742	.9659	1783	.8871	1824	.8736	1865	1.0243
1702	1.0226	1743	.7560	1784	.8705	1825	.7913	1866	1.2284
1703	1.1932	1744	.8375	1785	.8808	1826	.5668	1867	1.2838
1704	.6207	1745	1.2872	1786	.9206	1827	.9163	1868	1.2328
1705	1.1121	1746	.7562	1787	.9374	1828	1.0385	1869	1.3981
1706	.9873	1747	.5482	1788	1.3494	1829	.8100	1870	1.4569
1707	.8741	1748	.8954	1789	1.0650	1830	.6554	1871	1.0771
1708	.7151	1749	.6334	1790	1.0020	1831	.6139	1872	.9405
1709	.8917	1750	.6569	1791	.8867	1832	.6575	1873	1.1460
1710	1.0538	1751	1.1422	1792	.6509	1833	.7871	1874	1.3583
1711	.8763	1752	.9094	1793	.9913	1834	.9570	1875	1.0857

1876	1.0969	1918	1.2248	1960	.6466
1877	1.2020	1919	1.3603	1961	1.0493
1878	1.2972	1920	.7506	1962	.9083
1879	1.1780	1921	.7541	1963	.8444
1880	.9537	1922	.6856	1964	.9020
1881	.9725	1923	.7457	1965	1.0195
1882	1.2197	1924	.9312	1966	1.0911
1883	.9034	1925	.9011	1967	1.0682
1884	1.3206	1926	.7803	1968	.7660
1885	.7412	1927	.8288	1969	.6915
1886	1.0849	1928	1.2533	1970	.8756
1887	.9264	1929	1.2469	1971	.7700
1888	1.0963	1930	.9158	1972	.9466
1889	.7744	1931	.9518	1973	1.1311
1890	.7697	1932	.9322	1974	1.0097
1891	.8284	1933	1.0288	1975	1.1452
1892	.7677	1934	.8963	1976	1.0905
1893	.9493	1935	1.0544	1977	.8899
1894	.9611	1936	1.1012	1978	.7661
1895	.8369	1937	.9013	1979	1.1174
1896	.7631	1938	1.0870		
1897	1.0763	1939	1.2261		
1898	1.1628	1940	.8216		
1899	.9078	1941	.7506		
1900	.8462	1942	.7032		
1901	.8099	1943	.8756		
1902	.8810	1944	.9488		
1903	.8998	1945	.9522		
1904	.7715	1946	1.0807		
1905	.9853	1947	1.0670		
1906	.9130	1948	1.2483		
1907	1.1230	1949	1.3565		
1908	1.1263	1950	1.0513		
1909	1.1699	1951	1.0309		
1910	.8942	1952	1.3695		
1911	.9090	1953	1.2504		
1912	.8857	1954	1.0045		
1913	1.1454	1955	1.0750		
1914	.8020	1956	1.4192		
1915	.9889	1957	1.2282		
1916	.9667	1958	1.3653		
1917	1.1762	1959	1.2188		