[] Dendrochronology Program Library Run WLWO Program COF 16:16 Wed 27 Sep 2017 Page 1

[] P R O G R A M C O F E C H A Version 6.06P 30222

------------------------------------------------------------------------------------------------------------------------------------

QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: WLWO\_TSCA\_\_corr3-50

File of DATED series: WLWO\_TSCA\_corr3.txt

CONTENTS:

Part 1: Title page, options selected, summary, absent rings by series

Part 2: Histogram of time spans

Part 3: Master series with sample depth and absent rings by year

Part 4: Bar plot of Master Dating Series

Part 5: Correlation by segment of each series with Master

Part 6: Potential problems: low correlation, divergent year-to-year changes, absent rings, outliers

Part 7: Descriptive statistics

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 Y

8 Parts printed 1234567

9 Absent rings are omitted from master series and segment correlations (Y)

Time span of Master dating series is 1735 to 2016 282 years

Continuous time span is 1735 to 2016 282 years

Portion with two or more series is 1774 to 2016 243 years

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*C\* Number of dated series 30 \*C\*

\*O\* Master series 1735 2016 282 yrs \*O\*

\*F\* Total rings in all series 4055 \*F\*

\*E\* Total dated rings checked 4016 \*E\*

\*C\* Series intercorrelation .686 \*C\*

\*H\* Average mean sensitivity .321 \*H\*

\*A\* Segments, possible problems 0 \*A\*

\*\*\* Mean length of series 135.2 \*\*\*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

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

1644A 1 absent rings: 1826

1644B 1 absent rings: 1826

1667A 1 absent rings: 1926

1667B 2 absent rings: 1948 1950

1670B 1 absent rings: 1950

1761A 1 absent rings: 1926

1761B 1 absent rings: 1926

1764A 3 absent rings: 1862 1911 1926

1764B 1 absent rings: 1911

1767A 1 absent rings: 1934

1767B 1 absent rings: 1934

14 absent rings .345%

PART 2: TIME PLOT OF TREE-RING SERIES: WLWO\_TSCA\_\_corr3-50 16:16 Wed 27 Sep 2017 Page 2

------------------------------------------------------------------------------------------------------------------------------------

1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 2050 Ident Seq Time-span Yrs

: : : : : : : : : : : : : : : : : : : : : -------- --- ---- ---- ----

. . . . . . . . . . . . . . . . . . <=======> . 1643A 1 1938 2016 79

. . . . . . . . . . . . . . . . . . <=======> . 1643B 2 1938 2016 79

. . . . . . . . . . . . . . . <=====================> . 1644A 3 1793 2016 224

. . . . . . . . . . . . . . . <=====================> . 1644B 4 1792 2016 225

. . . . . . . . . . . . . . . . <===============> . 1663A 5 1850 2016 167

. . . . . . . . . . . . . . . . <===============> . 1663B 6 1850 2016 167

. . . . . . . . . . . . . . . . . . <======> . 1664A 7 1940 2016 77

. . . . . . . . . . . . . . . . . . <=======> . 1664B 8 1931 2016 86

. . . . . . . . . . . . . . . . . . .<====> . 1665A 9 1961 2016 56

. . . . . . . . . . . . . . . . . . <=====> . 1665B 10 1957 2016 60

. . . . . . . . . . . . . . . . . <============> . 1666A 11 1885 2016 132

. . . . . . . . . . . . . . . . . <==========> . 1666B 12 1901 2016 116

. . . . . . . . . . . . . . . . <==================> . 1667A 13 1820 2016 197

. . . . . . . . . . . . . . . . <==================> . 1667B 14 1820 2016 197

. . . . . . . . . . . . . . . . . . <======> . 1668A 15 1945 2016 72

. . . . . . . . . . . . . . . . . . <=======> . 1668B 16 1931 2016 86

. . . . . . . . . . . . . . . . . . <======> . 1669A 17 1946 2016 71

. . . . . . . . . . . . . . . . . . <======> . 1669B 18 1944 2016 73

. . . . . . . . . . . . . . . . . . <========> . 1670A 19 1920 2016 97

. . . . . . . . . . . . . . . . . . <========> . 1670B 20 1920 2016 97

. . . . . . . . . . . . . . . . . . <=======> . 1671A 21 1932 2016 85

. . . . . . . . . . . . . . . . . . <=======> . 1671B 22 1932 2016 85

. . . . . . . . . . . . . . . . .<==============> . 1761A 23 1866 2016 151

. . . . . . . . . . . . . . . . .<==============> . 1761B 24 1866 2016 151

. . . . . . . . . . . . . . . . <==================> . 1764A 25 1824 2016 193

. . . . . . . . . . . . . . . <=======================> . 1764B 26 1774 2016 243

. . . . . . . . . . . . . . . <=======================> . 1766A 27 1774 2016 243

. . . . . . . . . . . . . . <===========================> . 1766B 28 1735 2016 282

. . . . . . . . . . . . . . . . . <============> . 1767A 29 1887 2016 130

. . . . . . . . . . . . . . . . . <============> . 1767B 30 1883 2016 134

: : : : : : : : : : : : : : : : : : : : :

1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 2050

PART 3: Master Dating Series: WLWO\_TSCA\_\_corr3-50 16:16 Wed 27 Sep 2017 Page 3

------------------------------------------------------------------------------------------------------------------------------------

Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab

------------------ ------------------ ------------------ ------------------ ------------------ ------------------

1750 -.713 1 1800 1.305 5 1850 1.614 10 1900 -1.419 15 1950 -2.081 28 2

1751 .163 1 1801 1.078 5 1851 .519 10 1901 -.310 16 1951 .285 28

1752 .412 1 1802 .989 5 1852 -1.261 10 1902 1.335 16 1952 .567 28

1753 1.966 1 1803 -.554 5 1853 .444 10 1903 .522 16 1953 .141 28

1754 2.595 1 1804 -1.588 5 1854 .164 10 1904 .616 16 1954 .349 28

1755 .472 1 1805 .782 5 1855 .279 10 1905 .613 16 1955 .904 28

1756 1.148 1 1806 -.708 5 1856 -.402 10 1906 .117 16 1956 -.169 28

1757 -.536 1 1807 -.033 5 1857 .886 10 1907 -.720 16 1957 .343 29

1758 -2.007 1 1808 1.087 5 1858 .000 10 1908 -.885 16 1958 .177 29

1759 -.962 1 1809 .525 5 1859 -.464 10 1909 -.459 16 1959 -.032 29

1760 -.967 1 1810 .543 5 1860 -.613 10 1910 .420 16 1960 -.882 29

1761 -.859 1 1811 .340 5 1861 .462 10 1911 -1.383 16 2 1961 1.694 30

1762 -.633 1 1812 .503 5 1862 -1.318 10 1 1912 -1.326 16 1962 -.102 30

1763 -.950 1 1813 -1.575 5 1863 -.268 10 1913 .624 16 1963 -.289 30

1764 .445 1 1814 -1.733 5 1864 .871 10 1914 -.193 16 1964 .509 30

1765 1.030 1 1815 .524 5 1865 1.307 10 1915 .469 16 1965 -.839 30

1766 1.448 1 1816 -.807 5 1866 1.396 12 1916 .728 16 1966 -.062 30

1767 .491 1 1817 .658 5 1867 1.340 12 1917 .565 16 1967 1.153 30

1768 1.141 1 1818 -.675 5 1868 .286 12 1918 -1.314 16 1968 -.331 30

1769 1.669 1 1819 -.060 5 1869 -.896 12 1919 .788 16 1969 .511 30

1770 -2.495 1 1820 -.567 7 1870 -.814 12 1920 .069 18 1970 -2.273 30

1771 -1.475 1 1821 -.301 7 1871 .040 12 1921 .829 18 1971 -.671 30

1772 -.682 1 1822 .368 7 1872 .804 12 1922 1.115 18 1972 .841 30

1773 -.482 1 1823 .940 7 1873 -.156 12 1923 .271 18 1973 1.957 30

1774 -1.050 3 1824 .631 8 1874 1.221 12 1924 .901 18 1974 .318 30

1775 -.720 3 1825 -.874 8 1875 -.271 12 1925 .630 18 1975 -1.239 30

1776 1.005 3 1826 -1.850 8 2 1876 -.141 12 1926 -4.311 18 4 1976 -.323 30

1777 1.037 3 1827 .029 8 1877 -1.376 12 1927 -.983 18 1977 -.570 30

1778 1.300 3 1828 .402 8 1878 -.301 12 1928 .362 18 1978 -.593 30

1779 -.899 3 1829 .003 8 1879 -1.514 12 1929 .841 18 1979 -1.348 30

1780 -.879 3 1830 1.811 8 1880 -.857 12 1930 1.010 18 1980 -.271 30

1781 .207 3 1831 1.015 8 1881 .217 12 1931 .502 20 1981 -.148 30

1782 .393 3 1832 -.412 8 1882 .667 12 1932 .679 22 1982 .420 30

1783 .675 3 1833 .954 8 1883 .071 13 1933 .297 22 1983 .443 30

1784 -1.417 3 1834 .952 8 1884 -.414 13 1934 -1.434 22 2 1984 .556 30

1735 -2.285 1 1785 -1.125 3 1835 1.006 8 1885 -1.089 14 1935 -.599 22 1985 .611 30

1736 -.568 1 1786 .786 3 1836 -1.039 8 1886 1.066 14 1936 -1.312 22 1986 2.273 30

1737 .356 1 1787 1.820 3 1837 -.184 8 1887 .096 15 1937 .368 22 1987 1.125 30

1738 -.370 1 1788 1.786 3 1838 .990 8 1888 .012 15 1938 -.285 24 1988 -1.392 30

1739 .269 1 1789 1.361 3 1839 .216 8 1889 -.127 15 1939 -.011 24 1989 .422 30

1740 -.209 1 1790 .156 3 1840 -1.620 8 1890 -.088 15 1940 .648 25 1990 1.121 30

1741 1.885 1 1791 -.353 3 1841 -.797 8 1891 .235 15 1941 -.467 25 1991 .672 30

1742 2.985 1 1792 -1.804 4 1842 .781 8 1892 .902 15 1942 .080 25 1992 .108 30

1743 .466 1 1793 -.820 5 1843 -1.346 8 1893 .562 15 1943 .238 25 1993 -1.606 30

1744 -.130 1 1794 .224 5 1844 -1.011 8 1894 .827 15 1944 .066 26 1994 -1.024 30

1745 -.770 1 1795 -.200 5 1845 -.171 8 1895 -.322 15 1945 .915 27 1995 -1.754 30

1746 -1.193 1 1796 -.613 5 1846 -1.357 8 1896 -.555 15 1946 .503 28 1996 .502 30

1747 -.374 1 1797 -.257 5 1847 -1.974 8 1897 1.155 15 1947 1.129 28 1997 -1.062 30

1748 -1.375 1 1798 -.687 5 1848 1.425 8 1898 .509 15 1948 -1.861 28 1 1998 .930 30

1749 -1.110 1 1799 .216 5 1849 1.406 8 1899 -1.532 15 1949 -.782 28 1999 -.352 30

PART 3: Master Dating Series: WLWO\_TSCA\_\_corr3-50 16:16 Wed 27 Sep 2017 Page 4

------------------------------------------------------------------------------------------------------------------------------------

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 -.489 30

2001 .260 30

2002 -.144 30

2003 -1.581 30

2004 -.218 30

2005 1.668 30

2006 .155 30

2007 -.260 30

2008 -.110 30

2009 2.046 30

2010 1.551 30

2011 -.175 30

2012 -.314 30

2013 .679 30

2014 -.602 30

2015 .028 30

2016 -1.346 30

------------------------------------------------------------------------------------------------------------------------------------

PART 4: Master Bar Plot: WLWO\_TSCA\_\_corr3-50 16:16 Wed 27 Sep 2017 Page 5

------------------------------------------------------------------------------------------------------------------------------------

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

1750--c 1800---------E 1850----------F 1900f 1950h 2000---b

1751-----A 1801---------D 1851-------B 1901---a 1951------A 2001------A

1752------B 1802---------D 1852-e 1902---------E 1952-------B 2002----a

1753----------H 1803---b 1853-------B 1903-------B 1953-----A 2003f

1754----------J 1804f 1854-----A 1904-------B 1954------A 2004----a

1755-------B 1805--------C 1855------A 1905-------B 1955--------D 2005----------G

1756---------E 1806--c 1856---b 1906-----@ 1956----a 2006-----A

1757---b 1807-----@ 1857--------D 1907--c 1957------A 2007----a

1758h 1808---------D 1858-----@ 1908--d 1958-----A 2008----@

1759-d 1809-------B 1859---b 1909---b 1959-----@ 2009----------H

1760-d 1810-------B 1860--b 1910------B 1960--d 2010----------F

1761--c 1811------A 1861-------B 1911f 1961----------G 2011----a

1762--c 1812-------B 1862-e 1912-e 1962----@ 2012---a

1763-d 1813f 1863----a 1913-------B 1963----a 2013--------C

1764-------B 1814g 1864--------C 1914----a 1964-------B 2014--b

1765---------D 1815-------B 1865---------E 1915-------B 1965--c 2015-----@

1766----------F 1816--c 1866----------F 1916--------C 1966----@ 2016-e

1767-------B 1817--------C 1867---------E 1917-------B 1967---------E

1768---------E 1818--c 1868------A 1918-e 1968---a

1769----------G 1819----@ 1869--d 1919--------C 1969-------B

1770j 1820---b 1870--c 1920-----@ 1970i

1771f 1821---a 1871-----@ 1921--------C 1971--c

1772--c 1822------A 1872--------C 1922---------D 1972--------C

1773---b 1823---------D 1873----a 1923------A 1973----------H

1774-d 1824-------C 1874---------E 1924--------D 1974------A

1775--c 1825--c 1875----a 1925-------C 1975-e

1776---------D 1826g 1876----a 1926q 1976---a

1777---------D 1827-----@ 1877f 1927-d 1977---b

1778---------E 1828------B 1878---a 1928------A 1978--b

1779--d 1829-----@ 1879f 1929--------C 1979-e

1780--d 1830----------G 1880--c 1930---------D 1980----a

1781------A 1831---------D 1881------A 1931-------B 1981----a

1782------B 1832---b 1882--------C 1932--------C 1982------B

1783--------C 1833---------D 1883-----@ 1933------A 1983-------B

1784f 1834---------D 1884---b 1934f 1984-------B

1735i 1785-d 1835---------D 1885-d 1935--b 1985-------B

1736---b 1786--------C 1836-d 1886---------D 1936-e 1986----------I

1737------A 1787----------G 1837----a 1887-----@ 1937------A 1987---------D

1738---a 1788----------G 1838---------D 1888-----@ 1938----a 1988f

1739------A 1789----------E 1839------A 1889----a 1939-----@ 1989------B

1740----a 1790-----A 1840f 1890----@ 1940--------C 1990---------D

1741----------H 1791---a 1841--c 1891------A 1941---b 1991--------C

1742----------L 1792g 1842--------C 1892--------D 1942-----@ 1992-----@

1743-------B 1793--c 1843-e 1893-------B 1943------A 1993f

1744----a 1794------A 1844-d 1894--------C 1944-----@ 1994-d

1745--c 1795----a 1845----a 1895---a 1945---------D 1995g

1746-e 1796--b 1846-e 1896---b 1946-------B 1996-------B

1747---a 1797----a 1847h 1897---------E 1947---------E 1997-d

1748f 1798--c 1848----------F 1898-------B 1948g 1998---------D

1749-d 1799------A 1849----------F 1899f 1949--c 1999---a

PART 5: CORRELATION OF SERIES BY SEGMENTS: WLWO\_TSCA\_\_corr3-50 16:16 Wed 27 Sep 2017 Page 5

------------------------------------------------------------------------------------------------------------------------------------

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 1750 1775 1800 1825 1850 1875 1900 1925 1950 1975

1799 1824 1849 1874 1899 1924 1949 1974 1999 2024

--- -------- --------- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----

1 1643A 1938 2016 .76 .81 .72

2 1643B 1938 2016 .72 .78 .83

3 1644A 1793 2016 .49 .58 .63 .62 .70 .84 .73 .52 .58

4 1644B 1792 2016 .45 .59 .79 .76 .70 .80 .80 .64 .66

5 1663A 1850 2016 .55 .60 .67 .67 .62 .70

6 1663B 1850 2016 .61 .62 .58 .51 .63 .78

7 1664A 1940 2016 .74 .78 .80

8 1664B 1931 2016 .59 .63 .63

9 1665A 1961 2016 .84 .81

10 1665B 1957 2016 .77 .81

11 1666A 1885 2016 .76 .71 .76 .78 .83

12 1666B 1901 2016 .74 .74 .68 .65

13 1667A 1820 2016 .73 .76 .65 .45 .52 .60 .65 .63

14 1667B 1820 2016 .73 .75 .70 .54 .53 .56 .58 .66

15 1668A 1945 2016 .60 .65 .77

16 1668B 1931 2016 .51 .64 .68

17 1669A 1946 2016 .55 .61 .69

18 1669B 1944 2016 .68 .70 .68

19 1670A 1920 2016 .60 .60 .76 .76

20 1670B 1920 2016 .58 .61 .72 .73

21 1671A 1932 2016 .54 .56 .63

22 1671B 1932 2016 .61 .57 .65

23 1761A 1866 2016 .66 .71 .86 .71 .58 .61

24 1761B 1866 2016 .66 .66 .77 .83 .75 .77

25 1764A 1824 2016 .60 .61 .58 .75 .77 .74 .70 .56

26 1764B 1774 2016 .60 .60 .67 .74 .77 .75 .87 .79 .64 .62

27 1766A 1774 2016 .55 .54 .69 .77 .64 .71 .90 .88 .76 .78

28 1766B 1735 2016 .54 .53 .71 .83 .69 .71 .85 .85 .76 .76

29 1767A 1887 2016 .53 .75 .79 .75 .81

30 1767B 1883 2016 .68 .76 .76 .79 .85

Av segment correlation .56 .52 .66 .73 .66 .66 .73 .69 .69 .71

PART 6: POTENTIAL PROBLEMS: WLWO\_TSCA\_\_corr3-50 16:16 Wed 27 Sep 2017 Page 6

------------------------------------------------------------------------------------------------------------------------------------

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

Symbol following year indicates value in series is greater (>) or lesser (<) than master series value

[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

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

1643A 1938 to 2016 79 years Series 1

[B] Entire series, effect on correlation ( .723) is:

Lower 1941< -.020 2003> -.015 2000> -.014 2006< -.013 1964< -.007 2008< -.007 Higher 1948 .031 1970 .019

1643A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1938 299 260

1940 379 173 222 193 177 235 201 187 99 120

1950 96 160 154 155 200 181 115 121 106 97

1960 79 111 90 80 82 61 91 124 118 148

1970 68 124 169 217 135 91 163 111 121 101

1980 115 114 122 116 124 113 235 195 124 184

1990 213 169 152 95 143 89 190 123 200 147

2000 200 183 122 136 149 159 91 107 93 135

2010 185 114 111 117 101 94 72

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

1643B 1938 to 2016 79 years Series 2

[B] Entire series, effect on correlation ( .756) is:

Lower 1985< -.019 1948> -.015 1951< -.014 1949< -.012 1997> -.010 1966< -.009 Higher 1970 .023 2009 .013

1643B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1938 303 323

1940 480 337 273 378 380 413 320 318 195 145

1950 99 155 210 171 192 174 141 179 150 150

1960 122 210 119 143 139 84 91 130 111 159

1970 73 156 178 252 143 101 162 130 123 129

1980 187 165 199 164 160 116 379 199 111 188

1990 387 227 226 130 195 126 334 210 295 172

2000 189 185 170 132 175 232 206 160 147 317

2010 238 132 102 110 77 98 66

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

1644A 1793 to 2016 224 years Series 3

[B] Entire series, effect on correlation ( .651) is:

Lower 1970> -.025 2000< -.010 1888> -.008 1816> -.008 1801< -.007 1993> -.006 Higher 1926 .050 1988 .006

[D] 1 Absent rings: Year Master N series Absent

1826 -1.850 8 2

[E] Outliers 6 3.0 SD above or -4.5 SD below mean for year

1861 +3.8 SD; 1888 +3.9 SD; 1912 +3.1 SD; 1926 -4.9 SD; 1970 +4.7 SD; 2000 -5.2 SD

1644A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1793 18 21 21 25 24 33 30

1800 48 31 48 34 30 52 27 58 45 56

1810 29 33 50 28 15 45 38 44 11 24

1820 8 9 9 21 16 12 0 18 18 10

1830 40 29 24 37 26 30 14 13 19 18

1840 7 11 29 19 12 14 10 11 31 26

1850 26 35 19 23 21 26 22 31 26 20

1860 21 42 18 12 17 13 20 25 16 6

1870 12 18 11 8 22 13 15 7 13 9

1880 19 40 30 28 37 33 83 51 106 51

1890 65 59 73 61 84 61 59 113 80 34

1900 50 87 153 80 90 81 84 98 113 188

1910 239 128 199 283 157 233 218 170 109 163

1920 160 215 192 151 183 133 22 58 131 159

1930 164 131 119 106 80 74 65 117 101 95

1940 168 117 195 208 170 224 173 274 71 75

1950 49 85 97 74 75 101 78 94 76 75

1960 87 163 95 104 122 104 75 100 72 109

1970 115 95 94 106 83 61 43 75 88 77

1980 106 148 186 174 202 183 168 138 50 75

1990 120 138 109 105 99 57 108 90 155 82

2000 24 89 81 50 140 197 137 146 169 254

2010 257 192 156 224 149 186 108

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

1644B 1792 to 2016 225 years Series 4

[B] Entire series, effect on correlation ( .676) is:

Lower 1800< -.012 2000< -.012 1976< -.012 1993> -.009 1798> -.007 1887> -.006 Higher 1926 .037 1948 .008

[D] 1 Absent rings: Year Master N series Absent

1826 -1.850 8 2

[E] Outliers 5 3.0 SD above or -4.5 SD below mean for year

1798 +3.6 SD; 1887 +3.0 SD; 1976 -5.2 SD; 1993 +3.0 SD; 2000 -4.5 SD

1644B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1792 15 19 28 20 18 24 25 19

1800 14 13 21 11 9 20 12 15 19 20

1810 24 21 18 13 6 15 10 23 12 8

1820 4 3 3 13 11 12 0 14 9 13

1830 25 26 20 24 26 24 14 13 19 14

1840 6 9 23 15 15 22 12 12 55 50

1850 60 48 28 42 33 40 37 46 41 43

1860 42 40 29 25 47 52 69 59 48 17

1870 19 29 24 18 41 17 25 15 23 10

1880 18 44 71 58 54 66 177 209 194 90

1890 83 90 143 117 129 78 72 130 101 52

1900 71 102 127 88 152 126 100 106 98 122

1910 175 113 144 187 123 130 191 235 176 321

1920 246 211 246 187 164 109 13 45 93 135

1930 150 116 143 134 100 105 115 181 121 127

1940 220 148 179 175 179 205 211 161 61 75

1950 51 125 140 90 218 231 183 211 152 120

1960 104 211 206 173 166 138 113 198 103 141

1970 107 115 175 185 143 115 71 132 142 147

1980 200 200 248 240 246 238 246 228 90 183

1990 199 203 194 184 156 105 214 105 189 128

2000 51 103 104 67 77 129 103 123 118 212

2010 169 136 132 199 124 149 100

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

1663A 1850 to 2016 167 years Series 5

[B] Entire series, effect on correlation ( .637) is:

Lower 1931< -.015 1857< -.015 1918> -.010 1992< -.009 1969< -.009 2002< -.008 Higher 1926 .024 1948 .017

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

1857 -5.0 SD

1663A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1850 50 54 45 66 83 72 38 33 49 54

1860 62 151 113 180 190 216 210 221 138 142

1870 156 138 169 104 156 103 122 116 185 97

1880 119 107 207 158 150 112 207 121 60 68

1890 62 104 126 127 98 66 40 63 61 32

1900 32 43 83 99 76 122 104 84 72 75

1910 92 43 44 57 63 55 64 89 107 179

1920 135 159 176 146 202 137 64 97 117 99

1930 107 65 112 103 55 129 113 140 90 97

1940 82 76 133 141 108 121 129 137 37 62

1950 9 18 26 23 37 33 40 21 27 20

1960 27 41 22 24 24 18 24 29 23 16

1970 12 18 29 32 30 19 27 34 29 23

1980 36 45 50 51 65 96 123 86 47 79

1990 96 95 45 56 68 47 64 57 83 96

2000 66 92 42 23 47 99 75 69 80 162

2010 152 73 88 129 90 120 92

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

1663B 1850 to 2016 167 years Series 6

[B] Entire series, effect on correlation ( .626) is:

Lower 1934< -.016 1926> -.012 1954< -.008 1940< -.007 1888< -.007 1854< -.006 Higher 1948 .014 1986 .011

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

1926 +3.6 SD; 1934 -6.1 SD; 1951 +4.1 SD

1663B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1850 52 54 29 65 30 36 44 118 108 99

1860 75 162 134 201 192 333 223 214 102 65

1870 100 149 178 104 212 191 185 148 229 105

1880 109 115 215 193 176 100 186 99 44 74

1890 48 143 141 181 211 88 102 181 138 61

1900 68 90 150 174 101 154 136 94 90 65

1910 102 57 60 97 88 87 101 135 81 180

1920 213 228 355 287 268 220 126 191 231 178

1930 186 140 164 173 76 124 102 108 94 103

1940 70 58 78 92 74 74 103 81 15 36

1950 21 145 46 28 8 29 22 14 23 21

1960 21 38 25 26 25 18 33 31 29 24

1970 17 14 28 38 31 24 28 36 46 37

1980 73 96 130 137 156 145 296 164 91 140

1990 203 149 94 55 88 86 160 89 179 119

2000 38 134 92 43 103 230 142 104 117 202

2010 184 121 115 146 81 97 84

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

1664A 1940 to 2016 77 years Series 7

[B] Entire series, effect on correlation ( .760) is:

Lower 1988> -.020 1957< -.016 2006> -.014 1978> -.012 1989< -.008 2011> -.007 Higher 1970 .027 1986 .013

1664A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1940 301 198 206 186 189 224 193 254 129 146

1950 94 196 233 188 174 133 78 66 83 73

1960 95 156 76 107 105 62 102 117 104 131

1970 78 112 145 163 121 94 133 124 167 125

1980 155 136 180 161 166 171 279 198 151 133

1990 184 184 147 85 118 101 166 107 215 128

2000 139 127 101 79 167 201 230 159 195 240

2010 241 193 155 217 146 183 121

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

1664B 1931 to 2016 86 years Series 8

[B] Entire series, effect on correlation ( .604) is:

Lower 1970> -.033 1959< -.025 1932< -.024 2007< -.019 2011> -.015 1936> -.013 Higher 1948 .026 1993 .012

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

1970 +3.0 SD

1664B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1931 137 89 90 93 165 162 209 134 179

1940 248 145 185 161 157 207 168 193 91 96

1950 83 122 132 139 187 159 86 65 88 46

1960 63 113 54 83 73 43 91 101 65 104

1970 74 80 96 118 68 50 100 67 94 60

1980 84 81 97 94 136 139 187 142 108 125

1990 227 179 152 91 116 104 262 145 194 123

2000 205 139 109 97 145 218 205 95 157 216

2010 202 233 161 253 132 169 106

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

1665A 1961 to 2016 56 years Series 9

[B] Entire series, effect on correlation ( .816) is:

Lower 2011> -.032 2006> -.013 1968> -.010 1964< -.008 2001< -.007 1996< -.005 Higher 1970 .022 1986 .015

1665A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1961 527 282 272 239 153 224 280 262 340

1970 137 195 229 315 219 144 210 152 152 129

1980 165 160 214 211 240 233 384 211 135 178

1990 249 169 177 89 131 97 132 104 181 110

2000 128 133 141 137 177 328 302 185 247 386

2010 305 383 258 334 194 190 145

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

1665B 1957 to 2016 60 years Series 10

[B] Entire series, effect on correlation ( .786) is:

Lower 2006> -.015 1962> -.010 2000> -.009 1964< -.007 2003> -.006 1976> -.006 Higher 1970 .030 1961 .012

1665B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1957 252 222 274

1960 234 365 239 234 185 121 177 201 158 212

1970 74 122 173 171 128 98 145 97 91 82

1980 89 91 90 103 136 103 150 120 82 104

1990 136 128 106 63 110 91 170 118 156 118

2000 176 160 159 150 172 297 234 174 175 276

2010 225 181 178 217 132 156 128

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

1666A 1885 to 2016 132 years Series 11

[B] Entire series, effect on correlation ( .752) is:

Lower 1956< -.012 1927< -.010 1962> -.008 1974> -.007 1945< -.007 1912> -.007 Higher 1926 .056 1988 .007

1666A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1885 15 37 27 22 20

1890 36 59 73 51 70 46 40 67 64 24

1900 33 45 87 65 70 67 42 30 84 266

1910 366 177 260 273 241 270 313 298 201 265

1920 253 222 248 213 210 147 49 69 114 131

1930 114 87 87 85 55 47 27 43 40 50

1940 77 51 55 43 40 40 51 112 45 72

1950 39 62 62 74 69 72 45 73 84 73

1960 66 111 106 102 127 81 96 129 108 102

1970 74 94 112 133 139 80 98 81 83 106

1980 110 120 142 134 149 145 188 137 87 138

1990 165 130 126 99 112 82 170 108 138 107

2000 140 122 129 113 147 237 144 134 131 209

2010 214 173 158 208 148 228 164

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

1666B 1901 to 2016 116 years Series 12

[B] Entire series, effect on correlation ( .695) is:

Lower 1969< -.014 1927< -.010 2003> -.009 1979> -.008 1909> -.007 1972< -.007 Higher 1926 .065 1948 .021

1666B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1901 36 66 43 51 63 46 41 125 259

1910 326 159 224 251 219 269 250 201 86 200

1920 173 190 247 171 204 155 52 65 82 102

1930 99 98 101 110 75 58 46 69 67 72

1940 87 64 78 72 52 67 103 163 38 80

1950 57 104 85 94 78 99 70 88 91 58

1960 52 80 75 65 86 65 67 104 66 52

1970 56 61 72 130 108 85 113 121 95 111

1980 121 142 125 121 128 129 127 124 70 94

1990 111 105 103 70 66 59 117 82 103 91

2000 97 86 99 97 94 173 70 91 71 136

2010 127 80 73 82 80 95 82

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

1667A 1820 to 2016 197 years Series 13

[B] Entire series, effect on correlation ( .636) is:

Lower 1927> -.011 1907> -.008 1970> -.007 1971< -.007 1940< -.007 1903< -.006 Higher 1948 .017 1926 .012

[D] 1 Absent rings: Year Master N series Absent

1926 -4.311 18 4

[E] Outliers 4 3.0 SD above or -4.5 SD below mean for year

1862 -5.0 SD; 1908 +3.1 SD; 1927 +5.1 SD; 2004 +3.7 SD

1667A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1820 160 135 180 152 147 108 98 105 118 115

1830 139 118 83 152 136 163 103 114 156 138

1840 75 79 103 72 103 89 78 58 104 103

1850 120 75 53 70 73 63 47 67 53 52

1860 33 42 18 36 47 64 62 59 60 34

1870 20 26 47 47 57 48 42 26 32 20

1880 16 17 18 26 37 16 35 37 35 82

1890 101 76 102 106 105 67 65 140 106 54

1900 55 44 113 62 92 129 105 130 130 112

1910 131 89 61 86 73 144 113 86 49 107

1920 66 51 55 36 129 162 0 359 208 226

1930 125 102 85 57 21 21 26 47 43 44

1940 21 42 27 97 57 107 92 103 22 68

1950 32 78 79 60 45 73 67 110 96 82

1960 68 209 153 125 135 132 157 163 122 89

1970 88 57 94 206 136 112 102 116 90 84

1980 104 124 125 136 177 172 265 143 65 100

1990 168 122 72 74 110 75 95 77 149 152

2000 138 157 163 174 331 347 179 182 176 295

2010 251 175 153 125 114 114 111

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

1667B 1820 to 2016 197 years Series 14

[B] Entire series, effect on correlation ( .631) is:

Lower 1926> -.017 1970> -.012 1950< -.008 1993> -.006 1940< -.006 1918> -.006 Higher 1948 .016 1988 .009

[D] 2 Absent rings: Year Master N series Absent

1948 -1.861 28 1

1950 -2.081 28 2

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

1926 +3.8 SD; 1948 -5.3 SD; 1950 -6.4 SD

1667B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1820 146 180 202 184 234 172 116 138 145 138

1830 158 146 116 134 121 119 101 112 153 126

1840 73 82 94 50 71 65 54 42 61 65

1850 68 48 31 45 49 44 44 49 41 35

1860 28 46 28 32 57 57 45 39 38 25

1870 16 26 51 48 72 37 32 13 22 16

1880 17 14 22 38 27 20 56 48 41 78

1890 90 93 134 167 168 104 121 207 152 89

1900 65 76 157 88 93 145 123 126 112 94

1910 111 72 54 136 125 211 235 266 189 218

1920 140 158 142 109 108 151 95 166 166 238

1930 198 131 142 103 67 71 58 105 96 106

1940 54 65 51 58 62 84 74 83 0 50

1950 0 36 36 39 42 55 41 38 44 45

1960 44 74 65 51 57 61 62 60 50 47

1970 51 42 63 109 59 52 41 50 55 51

1980 57 67 74 61 64 76 89 101 47 60

1990 92 93 69 70 85 59 69 61 80 77

2000 64 82 71 66 105 170 89 81 78 202

2010 157 65 72 61 63 81 67

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

1668A 1945 to 2016 72 years Series 15

[B] Entire series, effect on correlation ( .619) is:

Lower 1954< -.075 1948> -.017 2000> -.014 1951< -.010 1955< -.009 1959> -.007 Higher 1970 .048 1973 .014

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

1954 -5.7 SD

1668A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1945 403 453 441 195 89

1950 130 124 237 162 19 111 188 244 244 262

1960 164 238 159 165 190 143 148 193 138 172

1970 80 119 134 182 125 86 88 79 105 80

1980 95 116 111 140 122 130 150 120 107 162

1990 156 140 135 72 110 103 164 118 211 149

2000 241 186 228 157 177 287 250 175 226 314

2010 216 177 134 330 195 245 176

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

1668B 1931 to 2016 86 years Series 16

[B] Entire series, effect on correlation ( .599) is:

Lower 1946< -.020 1947< -.012 1944< -.011 1950> -.010 1995> -.010 2007< -.010 Higher 1993 .020 2009 .019

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

1946 -4.8 SD

1668B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1931 335 314 155 128 180 131 194 135 148

1940 190 138 143 88 64 67 43 63 49 93

1950 75 135 99 101 107 118 105 142 135 151

1960 96 159 74 70 71 75 92 116 55 77

1970 47 72 73 88 47 41 50 57 66 55

1980 70 95 96 109 111 110 123 108 89 101

1990 99 94 105 67 82 87 127 73 140 109

2000 139 136 142 97 114 170 152 120 173 306

2010 236 234 166 294 197 240 142

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

1669A 1946 to 2016 71 years Series 17

[B] Entire series, effect on correlation ( .552) is:

Lower 2016> -.026 1946< -.024 1950> -.016 1951< -.016 1948> -.014 1957< -.013 Higher 1970 .063 1993 .023

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

2016 +3.2 SD

1669A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1946 112 144 125 130

1950 136 119 149 138 213 131 142 106 229 191

1960 186 208 161 128 177 131 111 162 42 178

1970 21 151 215 279 178 124 115 142 159 89

1980 116 116 158 167 202 203 295 192 155 216

1990 190 185 158 75 87 141 205 142 277 173

2000 266 237 213 92 132 238 220 182 214 265

2010 205 155 187 227 137 193 216

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

1669B 1944 to 2016 73 years Series 18

[B] Entire series, effect on correlation ( .655) is:

Lower 1968< -.016 2013< -.014 2014> -.011 2000> -.009 1965> -.009 1975> -.008 Higher 1970 .040 1993 .018

1669B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1944 150 136 89 124 68 57

1950 44 108 121 116 131 137 108 110 89 79

1960 109 130 120 73 142 119 134 181 40 147

1970 19 113 155 167 131 119 128 149 147 76

1980 143 121 155 151 114 114 222 178 115 156

1990 130 155 129 51 69 95 134 115 171 146

2000 194 199 204 75 126 228 183 151 142 185

2010 186 116 119 110 144 123 112

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

1670A 1920 to 2016 97 years Series 19

[B] Entire series, effect on correlation ( .663) is:

Lower 1947< -.019 1934> -.018 1946< -.006 1992> -.005 1935> -.005 2013< -.004 Higher 2009 .013 1986 .011

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

1934 +3.4 SD; 1970 -4.7 SD

1670A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1920 51 60 65 58 84 57 12 11 23 49

1930 73 59 54 67 56 62 31 45 40 36

1940 58 50 41 42 51 67 41 24 5 15

1950 36 250 331 216 348 303 302 291 344 340

1960 221 299 158 218 199 158 184 254 214 271

1970 68 173 193 183 134 89 122 75 85 74

1980 98 93 104 99 115 114 181 175 99 147

1990 133 147 184 66 101 93 160 119 170 125

2000 150 163 180 148 215 210 140 156 123 246

2010 215 146 156 132 123 109 97

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

1670B 1920 to 2016 97 years Series 20

[B] Entire series, effect on correlation ( .656) is:

Lower 1934> -.021 1936> -.015 1947< -.012 1948> -.012 1945< -.009 1988> -.008 Higher 1926 .030 1986 .017

[D] 1 Absent rings: Year Master N series Absent

1950 -2.081 28 2

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

1934 +3.5 SD; 1970 -6.5 SD

1670B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1920 49 71 82 52 84 71 13 26 34 39

1930 45 47 44 36 32 11 25 19 12 16

1940 15 15 18 7 16 20 21 16 25 58

1950 0 289 358 230 218 295 189 230 197 147

1960 143 205 113 113 150 110 110 132 69 122

1970 22 99 160 162 126 86 134 77 95 63

1980 94 61 104 93 116 100 468 181 111 149

1990 91 74 115 37 60 53 80 53 74 59

2000 80 79 90 65 98 181 136 174 152 266

2010 216 168 146 132 116 156 122

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

1671A 1932 to 2016 85 years Series 21

[B] Entire series, effect on correlation ( .539) is:

Lower 1934> -.027 1945< -.018 1996< -.016 1997> -.013 1994< -.012 1943< -.011 Higher 1973 .020 1970 .018

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

1934 +4.0 SD; 1992 +3.2 SD

1671A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1932 139 133 126 82 48 72 76 83

1940 102 74 76 40 50 30 20 34 16 27

1950 39 122 144 175 192 192 218 186 141 137

1960 130 145 92 112 102 59 75 96 77 114

1970 81 92 119 167 116 89 99 81 95 79

1980 77 77 102 123 164 120 168 119 97 133

1990 172 174 261 121 16 58 29 78 136 89

2000 39 62 69 67 110 239 179 171 169 234

2010 228 186 145 199 164 207 154

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

1671B 1932 to 2016 85 years Series 22

[B] Entire series, effect on correlation ( .579) is:

Lower 1962< -.069 1988> -.021 1996< -.016 2000< -.016 1934> -.013 1937< -.010 Higher 1970 .037 1986 .022

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

1934 +3.2 SD; 1988 +3.1 SD

1671B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1932 144 131 99 80 46 37 45 49

1940 51 36 54 50 46 74 77 95 53 72

1950 63 158 180 163 174 142 125 105 94 94

1960 91 166 54 79 85 53 73 92 89 117

1970 57 89 115 231 178 112 166 125 143 119

1980 110 108 94 144 167 165 312 215 180 225

1990 212 150 70 66 92 85 62 72 140 102

2000 47 89 106 96 110 160 132 137 143 229

2010 211 196 212 225 184 145 116

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

1761A 1866 to 2016 151 years Series 23

[B] Entire series, effect on correlation ( .727) is:

Lower 1970> -.014 1993> -.012 1963< -.009 1994< -.008 1881> -.007 1962> -.007 Higher 1926 .055 1948 .014

[D] 1 Absent rings: Year Master N series Absent

1926 -4.311 18 4

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

1881 +3.5 SD; 1970 +3.2 SD

1761A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1866 111 65 32 31

1870 27 36 61 79 132 84 68 42 103 100

1880 109 426 394 236 65 76 221 120 141 149

1890 109 111 128 73 107 112 162 313 223 91

1900 92 240 387 318 355 264 180 137 123 122

1910 154 84 62 198 132 152 166 156 54 176

1920 129 251 226 179 180 161 0 106 197 176

1930 194 178 144 114 50 39 56 132 142 94

1940 124 130 123 147 152 199 169 162 29 56

1950 30 76 98 106 90 142 67 91 68 83

1960 57 132 173 86 157 127 127 233 175 246

1970 194 212 362 387 257 174 170 223 143 130

1980 149 130 135 125 103 113 142 131 64 97

1990 90 101 66 64 37 40 57 45 46 49

2000 39 67 47 29 37 67 62 62 65 86

2010 93 59 73 84 78 58 58

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

1761B 1866 to 2016 151 years Series 24

[B] Entire series, effect on correlation ( .778) is:

Lower 1881> -.010 1976< -.008 1893< -.007 1975> -.007 1993> -.006 1940< -.006 Higher 1926 .051 1948 .006

[D] 1 Absent rings: Year Master N series Absent

1926 -4.311 18 4

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

1881 +4.0 SD; 1918 -4.6 SD

1761B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1866 128 118 46 31

1870 29 49 76 94 138 75 77 72 154 103

1880 131 388 339 151 122 114 207 146 163 168

1890 122 91 150 103 139 136 128 238 150 65

1900 68 212 360 315 276 181 179 132 97 119

1910 158 73 69 238 92 101 115 104 27 94

1920 87 131 93 80 83 103 0 74 107 112

1930 141 119 133 100 39 38 40 89 72 65

1940 45 56 57 74 84 209 140 141 21 51

1950 27 75 115 101 121 181 70 94 51 80

1960 65 132 79 39 103 74 97 119 75 84

1970 42 65 88 106 63 58 34 41 41 39

1980 53 46 67 74 62 74 93 87 42 89

1990 85 81 59 53 42 48 70 61 66 63

2000 53 93 64 41 49 88 66 71 76 131

2010 117 59 84 137 87 94 89

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

1764A 1824 to 2016 193 years Series 25

[B] Entire series, effect on correlation ( .709) is:

Lower 2011< -.022 2016> -.011 1866< -.009 1969< -.007 1979> -.006 1852> -.005 Higher 1926 .048 1988 .006

[D] 3 Absent rings: Year Master N series Absent

1862 -1.318 10 1

1911 -1.383 16 2

1926 -4.311 18 4

[E] Outliers 5 3.0 SD above or -4.5 SD below mean for year

1872 +3.0 SD; 1911 -5.3 SD; 1951 +3.1 SD; 2011 -6.1 SD; 2016 +3.2 SD

1764A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1824 28 16 20 26 39 39

1830 58 46 25 26 35 31 16 25 23 20

1840 18 23 22 12 15 23 15 17 33 36

1850 34 19 20 24 26 28 14 24 15 16

1860 20 13 0 11 12 22 12 19 13 16

1870 12 21 86 39 58 21 16 11 23 18

1880 28 37 50 46 57 49 113 71 74 69

1890 67 58 75 79 96 65 48 81 67 41

1900 39 58 99 93 84 75 67 23 37 52

1910 46 0 42 97 96 109 148 116 102 147

1920 106 153 184 153 178 155 0 71 133 143

1930 155 119 139 141 65 73 59 133 90 114

1940 128 84 82 88 105 150 122 173 92 101

1950 82 215 148 107 93 119 83 131 107 93

1960 49 102 72 57 90 73 87 88 71 50

1970 43 51 79 102 75 59 60 53 50 71

1980 71 76 65 83 63 86 121 83 46 95

1990 83 74 68 63 60 46 87 50 59 55

2000 67 78 79 53 59 79 45 59 56 61

2010 58 25 36 35 41 41 42

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

1764B 1774 to 2016 243 years Series 26

[B] Entire series, effect on correlation ( .721) is:

Lower 1970> -.015 1788< -.008 1960< -.007 1843> -.006 1984< -.006 1805< -.006 Higher 1926 .034 1948 .008

[D] 1 Absent rings: Year Master N series Absent

1911 -1.383 16 2

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

1960 -5.1 SD; 1970 +3.3 SD

1764B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1774 12 17 29 24 28 16

1780 16 21 19 23 15 17 19 30 22 22

1790 20 18 12 14 18 21 19 22 18 27

1800 37 34 30 27 25 25 26 26 41 39

1810 45 37 34 17 26 42 35 47 28 31

1820 36 34 39 47 62 38 37 73 92 83

1830 119 69 41 65 61 50 30 51 70 54

1840 40 47 65 56 40 59 41 42 89 84

1850 88 51 45 67 55 59 38 50 26 31

1860 28 29 19 27 43 32 33 31 25 15

1870 14 22 32 16 25 14 17 6 18 15

1880 18 44 87 67 73 65 142 80 109 98

1890 111 104 133 101 138 83 82 110 85 46

1900 58 79 116 83 113 102 83 22 26 14

1910 27 0 33 95 104 106 160 164 111 197

1920 147 164 185 154 143 148 21 79 117 110

1930 142 156 176 148 80 102 94 156 95 127

1940 148 103 107 117 117 138 168 153 49 76

1950 62 84 107 100 86 128 105 116 110 104

1960 73 126 121 105 120 116 116 151 137 125

1970 121 96 121 198 137 101 111 104 80 95

1980 96 99 113 115 81 115 169 145 69 92

1990 99 85 104 88 79 69 122 89 122 94

2000 107 125 123 82 65 100 64 77 65 100

2010 85 55 52 59 59 71 59

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

1766A 1774 to 2016 243 years Series 27

[B] Entire series, effect on correlation ( .753) is:

Lower 1856> -.008 1792> -.007 1993> -.006 1802< -.006 1886< -.006 1787< -.005 Higher 1926 .031 1986 .005

1766A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1774 11 13 25 20 23 11

1780 12 15 23 20 11 15 38 37 52 58

1790 35 23 19 30 30 27 18 18 9 21

1800 38 49 23 12 6 21 9 17 29 20

1810 21 25 25 15 16 30 23 32 38 44

1820 48 58 64 87 64 37 30 49 50 41

1830 64 54 51 57 57 56 33 39 53 37

1840 26 28 34 19 14 17 13 16 26 29

1850 28 21 12 20 19 21 32 35 28 14

1860 16 15 8 18 22 33 37 32 23 12

1870 15 26 35 19 28 15 21 9 12 10

1880 18 35 36 22 20 12 31 27 6 15

1890 100 224 314 204 166 102 78 149 166 97

1900 104 151 285 207 159 144 175 89 90 91

1910 119 63 71 116 122 184 233 180 112 159

1920 138 145 176 147 190 173 53 162 206 238

1930 199 143 143 128 69 106 99 139 132 111

1940 149 100 117 192 155 239 202 198 62 95

1950 35 148 112 102 102 175 111 204 140 156

1960 103 246 139 126 150 123 129 167 141 154

1970 106 113 196 223 115 93 107 120 90 77

1980 99 104 103 106 100 123 200 128 72 117

1990 139 116 106 101 96 69 121 68 130 89

2000 119 120 113 92 166 231 153 128 140 260

2010 238 157 147 166 136 143 115

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

1766B 1735 to 2016 282 years Series 28

[\*] Early part of series cannot be checked from 1735 to 1773 -- not matched by another series

[B] Entire series, effect on correlation ( .748) is:

Lower 1886< -.006 1809< -.005 1776< -.005 2000< -.004 1960< -.004 1806> -.004 Higher 1926 .024 1948 .008

1766B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1735 26 38 51 39 50

1740 41 94 144 52 37 24 17 29 12 15

1750 20 35 39 80 100 36 47 17 4 12

1760 12 12 14 11 21 26 30 21 26 31

1770 7 11 15 17 16 14 20 36 36 25

1780 24 39 39 44 24 21 46 61 74 44

1790 28 31 28 27 33 27 24 24 18 29

1800 43 56 39 26 17 43 32 21 31 19

1810 24 21 25 18 19 26 15 24 26 41

1820 43 58 72 59 39 28 33 62 63 46

1830 84 69 42 56 66 65 31 32 39 31

1840 23 25 40 22 22 31 22 13 34 31

1850 29 22 16 24 22 26 28 48 35 21

1860 31 34 23 30 58 58 68 84 59 41

1870 41 55 50 46 63 40 49 21 23 11

1880 45 61 47 37 30 20 43 40 39 38

1890 110 309 312 203 199 127 129 290 220 124

1900 123 209 293 261 272 194 202 146 136 116

1910 166 98 90 145 117 167 150 175 104 151

1920 108 135 150 111 157 151 61 183 223 286

1930 243 248 192 145 89 157 124 183 194 117

1940 167 143 153 245 217 316 267 239 61 102

1950 49 108 147 114 113 147 107 158 117 137

1960 80 171 133 102 136 116 124 156 134 182

1970 125 116 208 245 129 112 118 131 102 85

1980 105 145 149 129 114 122 147 149 74 114

1990 163 124 123 104 93 84 140 88 142 111

2000 70 113 119 102 128 221 159 138 134 232

2010 199 150 170 179 159 155 113

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

1767A 1887 to 2016 130 years Series 29

[B] Entire series, effect on correlation ( .681) is:

Lower 1892< -.019 1934< -.019 1973< -.016 1908< -.013 1899> -.011 1888> -.007 Higher 1970 .021 1948 .020

[D] 1 Absent rings: Year Master N series Absent

1934 -1.434 22 2

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

1892 -4.7 SD; 1899 +3.1 SD; 1934 -7.2 SD

1767A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1887 97 137 114

1890 97 86 75 132 113 133 131 155 241 176

1900 100 88 159 268 210 228 210 185 18 74

1910 135 82 101 187 190 184 179 154 78 146

1920 143 238 281 233 284 280 45 107 170 188

1930 223 258 153 139 0 134 76 134 98 141

1940 150 91 104 119 106 142 134 163 65 95

1950 74 120 109 113 153 147 133 162 132 146

1960 103 136 86 100 130 105 84 133 116 99

1970 54 87 102 93 97 83 150 127 115 95

1980 129 130 159 162 150 146 192 171 104 149

1990 140 141 123 62 83 57 103 101 172 138

2000 163 204 200 123 175 272 170 143 191 397

2010 296 187 179 258 190 191 146

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

1767B 1883 to 2016 134 years Series 30

[B] Entire series, effect on correlation ( .724) is:

Lower 1934< -.032 1887> -.008 1962< -.008 1884< -.006 1924< -.005 1971< -.005 Higher 1988 .009 2009 .008

[D] 1 Absent rings: Year Master N series Absent

1934 -1.434 22 2

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

1926 +3.1 SD; 1934 -8.3 SD

1767B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1883 110 59 59 123 166 166 149

1890 118 106 149 117 118 101 100 183 138 76

1900 79 204 298 233 268 216 121 46 31 58

1910 93 63 96 268 183 170 138 97 58 130

1920 169 290 219 127 112 224 58 120 167 155

1930 147 147 131 93 0 99 61 125 111 120

1940 113 101 182 174 160 199 156 173 83 107

1950 68 84 110 84 119 136 96 103 107 99

1960 81 135 64 78 127 103 128 143 114 103

1970 78 69 111 166 131 83 152 131 130 115

1980 137 116 145 145 183 152 226 216 100 145

1990 161 166 144 94 105 91 121 102 223 160

2000 174 241 192 138 197 278 195 198 221 357

2010 307 199 204 239 211 191 160

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

[\*] All segments correlate highest as dated with correlation with master series over .3281

PART 7: DESCRIPTIVE STATISTICS: WLWO\_TSCA\_\_corr3-50 16:16 Wed 27 Sep 2017 Page 7

------------------------------------------------------------------------------------------------------------------------------------

Corr //-------- Unfiltered --------\\ //---- Filtered -----\\

No. No. No. with Mean Max Std Auto Mean Max Std Auto AR

Seq Series Interval Years Segmt Flags Master msmt msmt dev corr sens value dev corr ()

--- -------- --------- ----- ----- ----- ------ ----- ----- ----- ----- ----- ----- ----- ----- --

1 1643A 1938 2016 79 3 0 .723 1.44 3.78 .551 .541 .263 2.81 .604 -.077 1

2 1643B 1938 2016 79 3 0 .756 1.92 4.80 .889 .575 .313 2.75 .467 .076 1

3 1644A 1793 2016 224 9 0 .651 .80 2.83 .645 .825 .376 2.67 .322 .046 1

4 1644B 1792 2016 225 9 0 .676 .96 3.21 .736 .852 .341 2.62 .407 .008 1

5 1663A 1850 2016 167 6 0 .637 .85 2.21 .499 .763 .310 2.72 .531 -.010 1

6 1663B 1850 2016 167 6 0 .626 1.11 3.55 .691 .701 .379 2.90 .362 -.008 1

7 1664A 1940 2016 77 3 0 .760 1.52 3.01 .522 .537 .274 2.93 .619 -.043 1

8 1664B 1931 2016 86 3 0 .604 1.31 2.62 .532 .515 .323 2.76 .713 .008 1

9 1665A 1961 2016 56 2 0 .816 2.14 5.27 .875 .495 .291 2.84 .484 -.081 1

10 1665B 1957 2016 60 2 0 .786 1.58 3.65 .620 .635 .261 2.69 .487 -.017 1

11 1666A 1885 2016 132 5 0 .752 1.14 3.66 .710 .820 .279 2.80 .375 .054 1

12 1666B 1901 2016 116 4 0 .695 1.05 3.26 .548 .707 .266 2.77 .437 .033 1

13 1667A 1820 2016 197 8 0 .636 .99 3.59 .597 .652 .326 2.88 .456 -.030 1

14 1667B 1820 2016 197 8 0 .631 .85 2.66 .517 .809 .286 2.64 .319 -.085 2

15 1668A 1945 2016 72 3 0 .619 1.72 4.53 .806 .614 .322 2.58 .507 .024 1

16 1668B 1931 2016 86 3 0 .599 1.20 3.35 .615 .718 .258 2.76 .502 .004 3

17 1669A 1946 2016 71 3 0 .552 1.67 2.95 .543 .299 .333 2.62 .491 -.046 1

18 1669B 1944 2016 73 3 0 .655 1.28 2.28 .413 .287 .320 2.53 .414 -.031 1

19 1670A 1920 2016 97 4 0 .663 1.31 3.48 .853 .791 .319 2.56 .349 -.081 1

20 1670B 1920 2016 97 4 0 .656 1.03 4.68 .808 .626 .401 2.99 .342 -.087 1

21 1671A 1932 2016 85 3 0 .539 1.14 2.61 .567 .741 .317 2.74 .469 .008 1

22 1671B 1932 2016 85 3 0 .579 1.19 3.12 .567 .726 .264 2.70 .383 -.057 1

23 1761A 1866 2016 151 6 0 .727 1.28 4.26 .809 .686 .349 2.68 .379 -.071 2

24 1761B 1866 2016 151 6 0 .778 1.00 3.88 .620 .613 .372 2.68 .340 -.067 2

25 1764A 1824 2016 193 8 0 .709 .65 2.15 .418 .752 .346 2.69 .348 .013 1

26 1764B 1774 2016 243 10 0 .721 .73 1.98 .451 .817 .291 2.75 .356 .006 1

27 1766A 1774 2016 243 10 0 .753 .86 3.14 .672 .821 .333 2.68 .345 -.050 3

28 1766B 1735 2016 282 10 0 .748 .88 3.16 .709 .846 .317 2.69 .431 -.072 2

29 1767A 1887 2016 130 5 0 .681 1.43 3.97 .600 .544 .321 2.60 .367 -.013 1

30 1767B 1883 2016 134 5 0 .724 1.41 3.57 .602 .593 .322 2.56 .344 .009 1

--- -------- --------- ----- ----- ----- ------ ----- ----- ----- ----- ----- ----- ----- ----- --

Total or mean: 4055 157 0 .686 1.09 5.27 .626 .710 .321 2.99 .410 -.021

- = [ COFECHA WLWO COF ] = -