[] Dendrochronology Program Library Run RSSM3 Program COF 13:52 Wed 06 Apr 2016 Page 1

[] P R O G R A M C O F E C H A Version 6.06P 29683

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: VMC1063\_ACSA\_Corr3-50 FINAL

File of DATED series: VMC1063\_ACSA\_Corr3

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 Y

8 Parts printed 1234567

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

Time span of Master dating series is 1883 to 2015 133 years

Continuous time span is 1883 to 2015 133 years

Portion with two or more series is 1884 to 2015 132 years

>> 1346A 2009 absent in 1 of 37 series, but is not usually narrow: master index is 1.383

>> 1346A 2010 absent in 1 of 37 series, but is not usually narrow: master index is .732

>> 1346A 2011 absent in 2 of 37 series, but is not usually narrow: master index is -.156

>> 1346A 2013 absent in 1 of 37 series, but is not usually narrow: master index is .271

>> 1346A 2014 absent in 2 of 37 series, but is not usually narrow: master index is .814

>> 1346A 2015 absent in 2 of 37 series, but is not usually narrow: master index is 1.156

>> 1346B 2011 absent in 2 of 37 series, but is not usually narrow: master index is -.156

>> 1479B 2014 absent in 2 of 37 series, but is not usually narrow: master index is .814

>> 1479B 2015 absent in 2 of 37 series, but is not usually narrow: master index is 1.156

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

\*C\* Number of dated series 38 \*C\*

\*O\* Master series 1883 2015 133 yrs \*O\*

\*F\* Total rings in all series 4542 \*F\*

\*E\* Total dated rings checked 4541 \*E\*

\*C\* Series intercorrelation .633 \*C\*

\*H\* Average mean sensitivity .283 \*H\*

\*A\* Segments, possible problems 4 \*A\*

\*\*\* Mean length of series 119.5 \*\*\*

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

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

1202B 2 absent rings: 2006 2012

1203B 1 absent rings: 1948

1279B 1 absent rings: 2006

1346A 9 absent rings: 1948 1988 2009 2010 2011 2012 2013 2014 2015

1346B 3 absent rings: 2006 2011 2012

1348A 2 absent rings: 2006 2012

1349B 1 absent rings: 1988

1352B 2 absent rings: 1945 2012

1454A 3 absent rings: 1989 2005 2012

1454B 2 absent rings: 2005 2006

1480B 2 absent rings: 2006 2012

1479B 3 absent rings: 1989 2014 2015

1479A 1 absent rings: 2006

32 absent rings .705%

1900 .365 33 1950 1.175 35 2000 -.132 37

1901 .779 33 1951 1.413 35 2001 .357 37

1902 -.633 33 1952 .056 35 2002 .441 37

1903 -2.918 34 1953 -.729 35 2003 .251 37

1904 .281 34 1954 -1.014 35 2004 .028 37

1905 -.821 34 1955 .809 35 2005 -1.478 37 2

1906 .087 35 1956 .392 37 2006 -2.571 37 7

1907 -.340 35 1957 .013 37 2007 -.612 37

1908 .706 35 1958 1.013 37 2008 1.521 37

1909 -.414 35 1959 -.619 37 2009 1.383 37 1<<

1910 .238 35 1960 -.087 37 2010 .732 37 1<<

1911 1.404 35 1961 .593 38 2011 -.156 37 2<<

1912 -.031 35 1962 -1.404 38 2012 -2.112 37 7

1913 -2.999 35 1963 -.344 38 2013 .271 37 1<<

1914 -.596 35 1964 -.727 38 2014 .814 37 2<<

1915 -.520 35 1965 -1.282 38 2015 1.156 37 2<<

1916 .355 35 1966 -1.426 38

1917 .563 35 1967 -.499 38

1918 -1.949 35 1968 -.789 38

1919 .594 35 1969 -.362 38

1920 1.884 35 1970 .744 38

1921 .771 35 1971 .432 38

1922 .755 35 1972 1.542 38

1923 -.598 35 1973 .881 38

1924 1.292 35 1974 1.346 38

1925 .224 35 1975 .473 38

1926 .465 35 1976 1.061 38

1927 .045 35 1977 -.044 38

1928 -.251 35 1978 .849 38

1929 -.814 35 1979 .318 38

1930 .182 35 1980 .844 38

1931 .652 35 1981 .375 38

1932 1.168 35 1982 .811 38

1883 -1.861 1 1933 -1.039 35 1983 -.714 38

1884 -3.113 4 1934 .583 35 1984 -.079 38

1885 -.013 5 1935 .781 35 1985 -.271 38

1886 .130 8 1936 -2.091 35 1986 -.887 37

1887 .188 13 1937 -.137 35 1987 -.949 37

1888 .478 13 1938 .450 35 1988 -2.290 37 2

1889 .042 16 1939 .117 35 1989 -1.452 37 2

1890 -.353 21 1940 -.493 35 1990 .200 37

1891 .123 23 1941 .471 35 1991 -.026 37

1892 .822 25 1942 1.389 35 1992 .275 37

1893 .298 26 1943 .907 35 1993 .142 37

1894 .822 29 1944 .560 35 1994 1.012 37

1895 -.407 31 1945 -2.088 35 1 1995 -.492 37

1896 1.943 32 1946 -1.351 35 1996 .598 37

1897 .056 33 1947 .678 35 1997 .894 37

1898 -.099 33 1948 -.637 35 2 1998 .292 37

1899 -.816 33 1949 .580 35 1999 1.200 37

PART 5: CORRELATION OF SERIES BY SEGMENTS: VMC1063\_ACSA\_Corr3-50 13:52 Wed 06 Apr 2016 Page 5

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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 1875 1900 1925 1950 1975

1924 1949 1974 1999 2024

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

1 1201A 1903 2015 .67 .56 .59 .56

2 1201B 1894 2015 .65 .71 .62 .61 .61

3 1202A 1895 2015 .64 .60 .33 .70 .75

4 1202B 1887 2015 .71 .72 .72 .71 .73

5 1203B 1889 2015 .55 .51 .48 .77 .84

6 1203A 1890 2015 .72 .71 .65 .63 .69

7 1279A 1956 2015 .44 .38

8 1279B 1956 2015 .56 .65

9 1346A 1893 2015 .58 .48 .46 .66 .47

10 1346B 1885 2015 .65 .75 .65 .58 .57

11 1347A 1887 2015 .35 .55 .48 .45 .61

12 1347B 1890 2015 .66 .68 .54 .37 .55

13 1348A 1894 2015 .81 .84 .83 .56 .50

14 1348B 1890 2015 .68 .71 .77 .77 .77

15 1349B 1892 2015 .62 .65 .73 .62 .66

16 1350A 1886 2015 .54 .69 .69 .57 .50

17 1350B 1961 2015 .53 .52

18 1351A 1891 1985 .59 .70 .60 .66

19 1352A 1896 2015 .79 .80 .74 .72 .82

20 1352B 1891 2015 .58 .59 .57 .56 .67

21 1353A 1894 2015 .74 .74 .65 .45 .61

22 1353B 1906 2015 .85 .81 .58 .70

23 1397A 1895 2015 .64 .61 .43 .24B .33A

24 1397B 1897 2015 .64 .65 .60 .58 .65

25 1450A 1887 2015 .66 .69 .68 .51 .57

26 1450B 1883 2015 .58 .63 .68 .73 .72

27 1451A 1889 2015 .52 .59 .59 .54 .61

28 1451B 1886 2015 .68 .75 .56 .50 .53

29 1452A 1890 2015 .79 .72 .64 .63 .66

30 1452B 1892 2015 .76 .74 .55 .48 .48

31 1453A 1887 2015 .73 .73 .63 .63 .74

32 1453B 1884 2015 .78 .79 .60 .47 .68

33 1454A 1887 2015 .66 .74 .62 .48 .41

34 1454B 1890 2015 .56 .56 .64 .57 .48

35 1480A 1884 2015 .81 .72 .67 .72 .74

36 1480B 1889 2015 .76 .77 .50 .37 .44

37 1479B 1884 2015 .66 .64 .55 .42B .41

38 1479A 1886 2015 .59 .68 .57 .34B .45

Av segment correlation .66 .68 .61 .56 .60

PART 6: POTENTIAL PROBLEMS: VMC1063\_ACSA\_Corr3-50 13:52 Wed 06 Apr 2016 Page 5

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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

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1201A 1903 to 2015 113 years Series 1

[B] Entire series, effect on correlation ( .634) is:

Lower 1903> -.020 2000> -.019 1940> -.017 1941< -.017 1945> -.015 1968> -.009 Higher 1913 .042 1918 .025

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

1940 +3.2 SD

1201A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1903 207 265 198 213 162 178 134

1910 146 207 127 58 101 88 82 109 41 107

1920 129 90 96 67 95 74 121 105 81 95

1930 122 118 121 66 143 170 93 138 124 122

1940 182 78 107 113 132 93 68 87 62 97

1950 106 77 71 73 66 108 76 85 79 44

1960 48 79 58 60 48 42 53 103 146 79

1970 137 136 156 148 218 170 227 124 140 117

1980 112 110 114 69 137 110 111 74 81 75

1990 84 72 67 59 66 49 89 75 82 96

2000 143 64 76 106 48 42 40 53 116 155

2010 110 133 74 140 142 199

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1201B 1894 to 2015 122 years Series 2

[B] Entire series, effect on correlation ( .617) is:

Lower 1903> -.027 1896< -.023 1965< -.016 1986> -.010 1897> -.009 1968> -.009 Higher 1913 .045 1988 .015

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

1903 +3.2 SD

1201B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1894 360 265 234 267 228 186

1900 196 219 194 181 239 144 157 113 119 115

1910 134 136 99 42 67 56 70 86 58 90

1920 126 112 101 67 94 39 103 71 63 80

1930 175 147 149 64 174 168 78 79 112 115

1940 119 124 163 153 185 107 78 102 81 122

1950 187 201 133 112 66 92 101 151 92 49

1960 89 82 59 89 94 31 74 98 153 107

1970 177 128 202 152 212 136 165 122 144 117

1980 139 136 128 102 89 92 103 58 43 64

1990 55 51 62 50 80 61 76 69 71 88

2000 63 65 62 53 49 47 64 109 207 184

2010 101 81 60 120 86 128

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1202A 1895 to 2015 121 years Series 3

[B] Entire series, effect on correlation ( .662) is:

Lower 1936> -.036 1931< -.036 1987< -.009 1959> -.008 1930< -.007 1945> -.006 Higher 1913 .034 1903 .021

1202A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1895 292 421 238 229 200

1900 212 239 188 108 218 128 107 111 95 68

1910 85 131 99 47 81 86 102 70 40 68

1920 125 95 104 85 113 84 138 99 100 82

1930 59 34 58 59 85 87 97 154 129 125

1940 82 103 113 87 74 67 72 71 69 72

1950 83 101 74 58 52 95 88 73 86 74

1960 62 74 58 61 47 56 33 34 39 34

1970 47 56 70 96 94 86 97 81 105 101

1980 116 99 100 63 70 80 58 33 28 47

1990 66 58 60 60 85 45 53 69 50 67

2000 47 60 52 66 49 36 29 36 109 92

2010 86 62 54 120 152 138

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1202B 1887 to 2015 129 years Series 4

[B] Entire series, effect on correlation ( .740) is:

Lower 1926< -.026 1921< -.011 1965> -.006 1946> -.004 1948< -.004 1929> -.004 Higher 1936 .021 1945 .013

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

2006 -2.571 37 7

2012 -2.112 37 7

1202B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1887 236 213 195

1890 208 273 319 292 246 186 319 206 213 168

1900 158 217 170 101 251 147 129 107 173 130

1910 194 235 174 79 159 153 152 142 56 112

1920 144 63 106 63 119 82 41 120 148 134

1930 147 150 173 98 187 170 44 174 143 141

1940 111 119 158 129 130 48 101 147 63 86

1950 113 130 93 96 80 110 90 84 99 72

1960 81 127 82 115 112 116 84 83 70 56

1970 92 118 197 246 270 221 203 128 163 179

1980 187 165 132 91 81 102 85 60 51 69

1990 78 60 64 58 54 48 55 53 59 71

2000 38 61 57 76 55 28 0 57 80 107

2010 88 48 0 153 200 220

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1203B 1889 to 2015 127 years Series 5

[B] Entire series, effect on correlation ( .618) is:

Lower 1947< -.031 1895< -.018 1913> -.017 1954> -.009 1946> -.008 1936> -.008 Higher 2006 .014 1988 .013

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

1948 -.637 35 2

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

1948 -5.4 SD

1203B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1889 418

1890 394 462 464 396 366 234 415 364 375 319

1900 389 348 227 144 252 183 151 149 161 119

1910 83 292 100 73 61 81 77 84 44 79

1920 129 152 141 85 142 175 171 112 108 91

1930 106 85 95 49 57 77 64 89 66 85

1940 79 83 98 82 64 46 93 37 0 104

1950 154 189 134 93 134 127 130 127 133 92

1960 93 104 72 71 60 83 91 127 119 105

1970 126 133 188 170 189 156 189 138 173 138

1980 129 153 140 104 114 114 78 69 45 48

1990 74 91 95 85 112 60 94 60 54 59

2000 39 74 63 49 39 24 4 25 60 41

2010 52 43 15 51 66 85

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1203A 1890 to 2015 126 years Series 6

[B] Entire series, effect on correlation ( .692) is:

Lower 1977< -.011 1954> -.009 1989> -.008 1914< -.008 1936> -.008 1948< -.008 Higher 1903 .017 2012 .015

1203A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1890 295 394 342 313 327 225 343 253 231 222

1900 237 242 188 133 202 166 148 156 192 144

1910 111 155 92 58 54 99 84 75 55 110

1920 159 146 161 90 142 108 127 101 99 85

1930 105 99 110 63 68 71 54 55 49 52

1940 35 53 76 72 66 35 56 62 31 67

1950 111 140 101 81 115 134 115 105 123 97

1960 106 132 93 115 137 153 127 183 180 189

1970 193 192 196 194 218 192 230 125 137 128

1980 165 171 170 135 138 110 97 118 90 134

1990 150 110 152 102 134 73 108 85 82 89

2000 61 76 65 100 79 56 36 44 86 66

2010 79 67 16 50 76 79

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1279A 1956 to 2015 60 years Series 7

[B] Entire series, effect on correlation ( .426) is:

Lower 1970< -.070 2012> -.059 1968> -.027 1969> -.017 2000> -.012 1975< -.009 Higher 2005 .043 2006 .031

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

1969 +3.3 SD

1279A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1956 124 145 175 99

1960 102 156 124 188 213 146 154 174 323 465

1970 239 237 299 392 361 199 186 143 143 110

1980 135 108 126 67 54 56 48 46 40 49

1990 56 58 69 69 94 83 113 143 149 150

2000 170 154 165 202 168 73 42 92 127 157

2010 141 144 176 190 211 234

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1279B 1956 to 2015 60 years Series 8

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

Lower 1963< -.024 1964> -.018 1957> -.017 1962> -.017 1999< -.012 1969> -.011 Higher 2006 .048 2005 .025

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

2006 -2.571 37 7

1279B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1956 122 162 151 110

1960 100 121 109 72 122 96 61 87 92 164

1970 176 165 153 135 286 213 165 122 144 83

1980 88 95 128 61 56 60 49 59 41 59

1990 59 68 85 85 117 85 122 113 113 86

2000 71 79 63 62 57 24 0 90 117 132

2010 109 108 89 124 158 181

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1346A 1893 to 2015 123 years Series 9

[B] Entire series, effect on correlation ( .495) is:

Lower 1936> -.033 2005> -.030 2009< -.020 1947< -.018 1999< -.012 2012> -.010 Higher 1896 .016 1918 .014

[C] Year-to-year changes diverging by over 4.0 std deviations:

1987 1988 -4.2 SD

[D] 9 Absent rings: Year Master N series Absent

1948 -.637 35 2

1988 -2.290 37 2

2009 1.383 37 1 >> WARNING: Ring is not usually narrow

2010 .732 37 1 >> WARNING: Ring is not usually narrow

2011 -.156 37 2 >> WARNING: Ring is not usually narrow

2012 -2.112 37 7

2013 .271 37 1 >> WARNING: Ring is not usually narrow

2014 .814 37 2 >> WARNING: Ring is not usually narrow

2015 1.156 37 2 >> WARNING: Ring is not usually narrow

>> WARNING: Last ring in series is ABSENT

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

1936 +3.1 SD; 1948 -4.9 SD; 1988 -6.8 SD; 2005 +3.3 SD

1346A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1893 232 272 222 336 219 232 191

1900 224 236 206 181 211 160 222 164 168 151

1910 176 157 95 90 92 108 108 141 69 175

1920 218 190 219 154 196 195 183 148 107 69

1930 94 77 116 102 160 229 200 224 217 155

1940 121 129 163 130 172 83 141 64 0 97

1950 120 180 116 95 102 113 99 86 91 74

1960 101 137 62 93 76 84 40 66 88 82

1970 154 149 160 159 157 120 160 93 112 129

1980 125 100 116 68 96 107 94 75 0 33

1990 60 67 67 54 51 32 45 45 38 22

2000 23 28 18 14 11 32 10 23 28 0

2010 0 0 0 0 0 0

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1346B 1885 to 2015 131 years Series 10

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

Lower 1887< -.023 1994< -.012 1918> -.011 1931< -.008 1964> -.007 1986> -.007 Higher 1913 .024 1945 .021

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

2006 -2.571 37 7

2011 -.156 37 2 >> WARNING: Ring is not usually narrow

2012 -2.112 37 7

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

1988 -5.0 SD

1346B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1885 320 394 190 422 372

1890 329 280 259 242 293 267 434 292 270 225

1900 232 250 227 167 267 214 263 190 231 171

1910 206 197 118 85 151 149 151 184 146 206

1920 267 220 192 117 176 166 179 136 127 137

1930 149 124 172 102 155 180 137 190 190 165

1940 190 176 190 168 203 92 113 185 159 142

1950 161 180 123 86 110 146 88 133 115 82

1960 80 111 55 74 99 69 31 62 49 34

1970 64 47 104 96 72 68 119 70 103 111

1980 95 97 110 77 93 110 92 69 18 44

1990 79 85 68 67 43 29 52 59 62 42

2000 41 58 49 37 43 32 0 53 62 37

2010 16 0 0 33 29 34

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1347A 1887 to 2015 129 years Series 11

[B] Entire series, effect on correlation ( .503) is:

Lower 1891< -.028 1936> -.028 1913> -.022 1966> -.012 1929> -.008 1959> -.007 Higher 1945 .035 2006 .015

1347A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1887 371 448 304

1890 281 175 251 193 221 208 188 146 146 129

1900 154 168 127 107 104 84 129 98 120 86

1910 87 100 92 86 79 71 116 99 81 119

1920 142 90 102 71 115 85 110 104 98 132

1930 128 171 147 105 119 104 115 111 113 104

1940 83 92 118 116 91 40 75 96 58 93

1950 80 67 71 61 40 69 66 59 89 76

1960 69 81 67 105 66 64 91 51 39 67

1970 78 99 97 82 85 93 86 74 80 93

1980 117 83 98 70 80 65 47 62 45 41

1990 67 68 60 63 80 50 39 70 26 49

2000 33 58 47 47 71 19 6 37 92 63

2010 68 25 30 52 59 81

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1347B 1890 to 2015 126 years Series 12

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

Lower 1974< -.019 1987> -.018 1967< -.017 1913> -.015 1891< -.008 1948> -.007 Higher 1903 .031 1945 .017

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

1987 +3.2 SD

1347B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1890 337 276 378 321 274 259 310 251 290 241

1900 256 262 168 81 144 152 179 129 161 117

1910 101 119 102 94 109 81 131 149 98 154

1920 164 144 129 86 141 106 104 110 123 124

1930 116 156 140 117 133 155 108 167 172 186

1940 117 144 163 183 175 53 138 192 161 186

1950 158 123 123 96 96 115 109 78 99 92

1960 129 125 89 86 78 83 68 41 50 59

1970 107 110 138 116 85 130 133 139 153 161

1980 204 165 196 117 146 112 123 189 111 90

1990 111 82 70 66 104 67 75 130 95 158

2000 78 97 126 86 94 31 24 65 145 110

2010 134 85 63 92 125 145

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1348A 1894 to 2015 122 years Series 13

[B] Entire series, effect on correlation ( .749) is:

Lower 1976< -.021 1918> -.019 1904< -.010 1954> -.006 1984> -.006 1959> -.005 Higher 1913 .027 1936 .019

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

2006 -2.571 37 7

2012 -2.112 37 7

1348A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1894 220 193 235 203 228 207

1900 221 224 168 65 89 118 157 134 158 154

1910 156 209 158 63 101 139 192 187 166 184

1920 224 187 193 148 215 218 197 172 179 157

1930 233 239 298 149 191 251 99 145 211 157

1940 187 182 205 210 190 76 97 141 99 110

1950 130 191 133 112 141 142 189 146 171 145

1960 128 152 85 109 93 93 99 126 150 175

1970 183 221 231 189 186 129 74 69 105 121

1980 158 170 163 119 211 186 153 115 80 113

1990 100 85 118 105 152 94 113 100 99 94

2000 62 58 37 34 46 27 0 32 70 89

2010 51 54 0 9 56 69

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1348B 1890 to 2015 126 years Series 14

[B] Entire series, effect on correlation ( .719) is:

Lower 1918> -.040 1890> -.011 1904< -.010 1948> -.009 1990< -.008 1969< -.006 Higher 1913 .017 1903 .015

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

1918 +3.4 SD

1348B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1890 223 217 179 151 161 148 177 122 139 107

1900 100 128 78 30 40 74 126 124 130 109

1910 122 165 126 49 88 119 181 201 207 171

1920 184 146 142 116 180 211 167 144 171 148

1930 172 157 156 80 108 145 61 97 130 139

1940 126 123 141 108 100 45 53 103 125 108

1950 132 146 78 69 84 102 102 83 90 89

1960 86 119 70 98 100 82 81 109 135 102

1970 159 192 212 180 188 143 163 134 163 148

1980 147 136 127 93 123 112 92 56 32 48

1990 52 73 100 89 85 55 79 88 84 91

2000 81 72 44 55 65 34 6 51 94 143

2010 94 70 4 20 57 81

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1349B 1892 to 2015 124 years Series 15

[B] Entire series, effect on correlation ( .668) is:

Lower 1913> -.033 1995> -.011 1936> -.011 1942< -.008 1999< -.007 1998> -.007 Higher 1945 .017 2012 .017

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

1988 -2.290 37 2

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

1988 -4.7 SD

1349B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1892 384 325 280 240 361 213 195 191

1900 224 236 220 184 251 207 200 173 185 162

1910 179 220 184 168 181 170 148 124 78 138

1920 202 148 158 140 297 228 221 173 107 85

1930 108 139 158 109 137 125 80 58 52 63

1940 50 72 57 71 56 18 15 78 53 71

1950 86 109 66 63 56 91 83 64 71 55

1960 70 78 34 55 61 52 38 45 40 54

1970 61 58 96 95 98 70 81 75 64 58

1980 53 60 73 57 54 56 31 31 0 15

1990 18 18 22 24 31 31 26 22 32 21

2000 21 18 23 19 18 12 4 20 19 22

2010 25 18 3 24 23 31

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1350A 1886 to 2015 130 years Series 16

[B] Entire series, effect on correlation ( .614) is:

Lower 1918> -.019 1904< -.017 1887> -.013 1988> -.012 1989> -.011 1888< -.010 Higher 1913 .041 1936 .032

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

1945 -5.3 SD

1350A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1886 223 348 223 229

1890 219 210 211 172 228 171 268 211 182 165

1900 232 201 144 38 36 43 80 80 143 122

1910 127 152 154 40 164 155 206 203 164 171

1920 193 152 142 158 207 181 166 135 119 169

1930 114 151 150 130 163 195 57 159 163 110

1940 83 124 134 100 131 6 52 139 115 131

1950 145 165 118 87 104 126 137 91 125 102

1960 150 127 78 98 89 79 110 204 210 245

1970 225 184 189 162 226 195 220 160 180 137

1980 153 103 108 69 53 61 52 19 70 129

1990 113 122 109 106 125 71 77 86 79 90

2000 87 51 63 60 32 29 34 36 72 89

2010 51 56 34 50 75 117

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1350B 1961 to 2015 55 years Series 17

[B] Entire series, effect on correlation ( .567) is:

Lower 1989> -.035 1988> -.026 1983> -.023 2006> -.015 2004< -.012 2001< -.011 Higher 1962 .040 2012 .030

1350B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1961 188 76 80 64 73 86 108 134 169

1970 252 269 234 184 185 114 115 61 115 77

1980 82 76 177 171 201 162 72 21 52 147

1990 138 127 105 111 142 71 124 101 98 110

2000 80 57 52 60 38 27 31 31 64 71

2010 51 56 34 55 59 60

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1351A 1891 to 1985 95 years Series 18

[B] Entire series, effect on correlation ( .608) is:

Lower 1967> -.016 1899> -.014 1924< -.014 1897> -.012 1959> -.011 1903> -.010 Higher 1913 .069 1936 .025

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

1967 +3.0 SD

1351A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1891 299 294 352 462 364 497 488 400 460

1900 517 330 240 224 295 240 293 224 215 123

1910 136 155 101 18 47 94 140 115 75 113

1920 136 86 77 67 55 55 46 92 76 47

1930 82 68 58 45 44 57 19 28 117 60

1940 66 93 125 88 87 18 21 100 42 87

1950 105 81 48 47 44 114 66 42 91 87

1960 76 54 46 49 52 55 78 161 125 95

1970 105 89 95 115 122 106 156 118 146 118

1980 131 90 89 70 49 44

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1352A 1896 to 2015 120 years Series 19

[B] Entire series, effect on correlation ( .764) is:

Lower 1918> -.017 1951< -.014 1952> -.006 1926< -.005 1968> -.005 1919< -.005 Higher 1936 .018 2012 .007

1352A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1896 355 248 253 238

1900 270 259 211 180 240 206 200 186 212 185

1910 217 250 212 148 151 131 147 152 149 151

1920 212 200 196 180 240 171 143 147 134 154

1930 189 195 172 133 158 161 99 110 167 145

1940 128 186 194 180 147 100 87 143 96 107

1950 155 96 112 70 43 71 68 64 106 67

1960 78 104 67 72 64 51 42 60 78 73

1970 89 89 98 101 116 98 122 108 132 113

1980 106 100 106 89 106 84 72 58 47 66

1990 73 90 92 90 89 82 87 94 96 92

2000 73 77 96 84 84 52 34 57 100 77

2010 69 48 12 71 77 70

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1352B 1891 to 2015 125 years Series 20

[B] Entire series, effect on correlation ( .642) is:

Lower 1918> -.029 1988> -.015 1951< -.012 1914> -.008 1931< -.007 1913> -.007 Higher 2012 .019 1945 .013

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

1945 -2.088 35 1

2012 -2.112 37 7

1352B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1891 350 389 446 374 325 421 254 215 189

1900 190 198 169 132 174 132 141 141 151 152

1910 172 220 148 121 225 128 174 144 167 174

1920 217 206 181 153 185 171 130 144 133 106

1930 96 91 115 102 147 171 83 104 120 92

1940 78 123 135 156 126 0 67 114 80 129

1950 118 70 86 79 40 94 80 67 103 61

1960 106 127 80 105 89 68 66 61 41 70

1970 80 79 118 128 104 104 127 108 129 131

1980 134 106 114 78 98 75 56 48 70 62

1990 64 71 63 73 66 52 56 76 57 90

2000 57 72 91 78 80 29 36 57 134 96

2010 72 58 0 78 84 88

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

1353A 1894 to 2015 122 years Series 21

[B] Entire series, effect on correlation ( .641) is:

Lower 1989< -.025 1976< -.012 1986> -.011 1905> -.009 1977< -.009 1911< -.009 Higher 1913 .036 1936 .022

1353A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1894 317 220 271 192 196 157

1900 121 92 67 43 142 124 75 112 96 81

1910 76 59 57 17 34 49 68 107 70 122

1920 123 130 140 133 188 164 152 106 100 109

1930 139 185 230 161 231 212 114 173 182 172

1940 207 231 252 227 213 133 167 172 143 145

1950 171 144 101 109 80 176 129 109 153 115

1960 154 120 113 152 156 155 144 133 129 151

1970 193 130 220 144 202 149 122 94 152 172

1980 186 169 162 129 139 110 142 128 110 85

1990 121 110 98 112 121 109 122 111 101 186

2000 98 101 105 121 93 44 29 47 110 130

2010 112 70 22 72 91 84

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

1353B 1906 to 2015 110 years Series 22

[B] Entire series, effect on correlation ( .771) is:

Lower 1988> -.037 1965> -.009 1976< -.007 1922< -.007 1964> -.006 1929> -.006 Higher 1913 .031 1936 .017

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

1988 +3.4 SD

1353B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1906 125 118 102 68

1910 101 91 79 27 62 69 93 81 53 90

1920 143 113 88 80 165 152 139 100 160 156

1930 167 176 202 106 196 160 91 147 177 152

1940 148 175 181 171 142 108 117 151 99 159

1950 165 160 129 125 123 171 134 149 188 126

1960 177 166 139 153 184 183 168 158 166 167

1970 214 224 280 196 267 216 189 176 196 196

1980 266 224 221 149 216 166 175 183 251 170

1990 278 265 234 223 259 210 200 201 198 324

2000 184 207 213 195 139 111 69 114 167 163

2010 152 105 24 115 137 113

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

1397A 1895 to 2015 121 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

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

1950 1999 3 .03 -.18 .02 -.27 -.21 -.22 -.06 -.05 .04 -.35 .24| .04 .20 .46\* .23 .14 .35 .07 .10 .12 .00

1966 2015 0 .12 -.09 -.26 -.18 -.04 -.06 -.22 -.37 -.28 -.29 .33\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .507) is:

Lower 1956< -.031 1913> -.026 1988> -.024 2006> -.012 1929< -.010 1989> -.009 Higher 1903 .036 1918 .025

1950 to 1999 segment:

Lower 1956< -.094 1988> -.075 1989> -.030 1987> -.022 1982< -.017 1954> -.014 Higher 1962 .036 1974 .028

1966 to 2015 segment:

Lower 1988> -.078 1989> -.033 2006> -.027 2015< -.024 1987> -.024 1982< -.020 Higher 2008 .056 2005 .045

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

1903 -5.5 SD; 1988 +3.3 SD

1397A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1895 232 325 251 206 158

1900 233 229 194 43 241 199 192 168 212 128

1910 127 194 151 161 217 165 194 206 91 221

1920 286 227 213 162 202 202 216 211 173 34

1930 56 140 212 174 215 264 142 214 283 199

1940 180 209 211 189 185 132 57 119 147 157

1950 189 165 153 122 130 166 17 51 80 49

1960 82 84 54 65 53 61 103 187 185 196

1970 213 218 208 180 235 190 190 167 168 118

1980 148 137 114 91 107 72 75 113 125 131

1990 135 110 93 62 81 73 78 67 46 66

2000 53 43 43 40 51 35 62 77 145 147

2010 105 79 67 116 129 96

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

1397B 1897 to 2015 119 years Series 24

[B] Entire series, effect on correlation ( .625) is:

Lower 1913> -.045 1929< -.016 1945> -.012 1951< -.011 1989> -.009 1956> -.007 Higher 1903 .026 1918 .025

1397B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1897 286 306 240

1900 314 301 241 110 230 163 177 150 168 127

1910 146 165 116 138 142 137 133 147 81 132

1920 161 136 158 116 180 165 182 178 177 64

1930 129 206 194 124 153 137 94 175 207 150

1940 154 195 215 215 214 146 109 164 135 182

1950 125 91 68 82 95 120 198 76 104 33

1960 75 66 38 60 59 62 48 65 64 77

1970 116 82 146 103 144 110 133 99 97 82

1980 92 78 67 50 64 46 42 59 52 67

1990 70 61 56 50 54 43 63 46 31 41

2000 25 25 20 23 23 26 21 36 64 63

2010 52 36 27 42 53 75

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

1450A 1887 to 2015 129 years Series 25

[B] Entire series, effect on correlation ( .645) is:

Lower 1996< -.017 1913> -.017 1966> -.011 1948> -.009 1987> -.009 1973< -.007 Higher 1918 .023 1936 .015

1450A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1887 168 169 213

1890 167 186 210 304 296 272 361 232 228 231

1900 282 275 192 162 181 122 136 164 183 157

1910 182 226 191 140 139 109 128 164 65 165

1920 206 227 186 145 220 205 199 174 132 147

1930 135 177 171 64 110 108 67 128 148 102

1940 79 139 149 112 125 82 115 141 143 155

1950 124 192 138 108 102 122 117 121 166 96

1960 120 123 73 71 85 48 101 90 67 95

1970 106 77 137 86 122 79 114 137 149 109

1980 125 148 114 96 89 88 77 108 76 82

1990 112 106 87 96 76 72 52 84 103 93

2000 87 60 76 60 65 41 12 51 132 124

2010 73 58 19 51 60 68

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

1450B 1883 to 2015 133 years Series 26

[\*] Early part of series cannot be checked from 1883 to 1883 -- not matched by another series

[B] Entire series, effect on correlation ( .654) is:

Lower 1903> -.048 1884> -.029 1938< -.014 2014< -.009 2000> -.008 1973< -.006 Higher 1913 .022 1918 .018

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

1903 +4.1 SD

1450B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1883 108 118 185 233 291 243 193

1890 184 207 232 186 231 143 216 142 138 134

1900 142 144 117 152 150 102 99 99 118 108

1910 120 126 100 80 120 119 161 141 88 118

1920 150 132 158 152 195 177 176 162 160 113

1930 121 138 170 135 161 138 82 108 76 71

1940 71 100 130 125 109 81 111 154 117 115

1950 130 179 121 83 86 104 99 110 119 64

1960 81 92 69 75 53 39 58 82 57 59

1970 89 67 137 86 122 107 121 146 157 137

1980 130 127 140 109 79 65 45 70 42 39

1990 65 63 77 88 110 70 71 91 82 91

2000 104 77 74 67 70 42 16 51 131 110

2010 73 52 30 60 36 54

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

1451A 1889 to 2015 127 years Series 27

[B] Entire series, effect on correlation ( .535) is:

Lower 1998< -.037 1901< -.023 1913> -.015 1959> -.014 1948> -.009 1925< -.008 Higher 1936 .017 1988 .014

1451A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1889 266

1890 192 124 92 132 144 84 86 80 46 10

1900 49 12 25 17 69 78 103 57 131 133

1910 176 170 126 104 142 107 165 200 127 153

1920 178 182 150 110 144 85 103 85 88 82

1930 110 138 130 97 103 117 76 95 107 103

1940 75 72 115 100 87 66 47 104 108 122

1950 128 105 45 25 44 75 67 52 65 84

1960 65 79 69 83 72 60 57 66 51 39

1970 61 88 135 118 115 113 135 101 98 101

1980 97 79 91 93 96 84 71 90 48 57

1990 113 105 114 96 102 77 91 106 57 109

2000 87 90 125 106 114 85 76 94 156 140

2010 125 83 71 96 128 141

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

1451B 1886 to 2015 130 years Series 28

[B] Entire series, effect on correlation ( .578) is:

Lower 1986< -.035 1890< -.033 1987> -.009 1899> -.007 1941< -.007 1939> -.005 Higher 1913 .035 1903 .029

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

1890 -4.7 SD

1451B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1886 312 304 360 295

1890 181 338 299 297 293 288 425 310 257 266

1900 206 179 155 87 176 138 130 110 138 105

1910 96 104 79 40 63 69 82 109 73 96

1920 138 128 124 82 110 84 112 99 101 96

1930 114 146 149 103 131 137 116 193 223 255

1940 177 123 186 161 189 126 136 191 141 120

1950 115 166 80 62 70 85 78 82 140 107

1960 120 165 124 152 125 98 130 151 116 143

1970 193 204 221 178 163 173 167 164 155 161

1980 161 167 152 145 148 163 105 146 106 117

1990 168 139 116 120 114 93 101 128 121 142

2000 102 105 141 98 125 93 78 69 139 139

2010 103 68 23 51 77 102

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

1452A 1890 to 2015 126 years Series 29

[B] Entire series, effect on correlation ( .707) is:

Lower 1944< -.020 1945> -.013 2008< -.009 1981< -.007 1911< -.006 1975< -.006 Higher 1918 .012 1913 .011

1452A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1890 252 244 281 261 285 220 248 166 156 121

1900 146 150 103 86 113 89 97 97 132 116

1910 113 100 90 69 105 104 95 111 63 123

1920 159 134 124 114 152 102 100 104 114 111

1930 154 169 159 106 125 142 97 136 111 104

1940 80 91 110 109 70 69 69 88 64 71

1950 78 76 52 49 46 61 90 72 97 83

1960 85 118 93 103 103 81 82 136 152 171

1970 256 240 235 180 240 139 155 136 155 123

1980 112 89 123 94 92 83 77 86 76 73

1990 73 71 68 71 114 89 95 95 71 88

2000 62 50 58 45 36 28 15 20 22 42

2010 32 25 5 14 24 32

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1452B 1892 to 2015 124 years Series 30

[B] Entire series, effect on correlation ( .641) is:

Lower 1990< -.017 1951< -.016 1945> -.013 1925< -.010 2006> -.008 2005> -.007 Higher 1903 .027 1918 .023

1452B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1892 308 218 221 152 190 101 108 101

1900 140 152 93 45 72 59 71 73 90 70

1910 70 84 70 50 86 59 82 66 35 84

1920 106 70 66 45 67 45 56 68 78 72

1930 67 87 114 86 101 92 61 70 95 93

1940 96 100 119 110 94 78 51 71 55 90

1950 104 73 57 70 84 101 95 90 118 99

1960 93 118 94 99 100 88 102 145 159 183

1970 203 134 147 128 171 119 163 142 179 140

1980 153 129 141 108 123 118 81 97 61 40

1990 32 41 40 71 100 80 86 76 88 100

2000 58 78 99 97 47 49 44 46 56 41

2010 30 37 6 25 45 69

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

1453A 1887 to 2015 129 years Series 31

[B] Entire series, effect on correlation ( .701) is:

Lower 1903> -.030 1888< -.019 1945> -.015 1972< -.010 2000< -.009 1961< -.007 Higher 1913 .025 1936 .023

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

1903 +3.0 SD

1453A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1887 315 282 282

1890 307 315 363 349 341 300 403 315 303 280

1900 278 350 288 292 434 280 319 227 273 166

1910 224 211 151 57 112 112 167 169 66 142

1920 149 129 82 65 107 101 112 75 66 63

1930 83 88 113 78 99 80 34 53 67 74

1940 62 85 89 67 68 62 43 77 66 81

1950 81 74 69 60 45 66 71 70 68 48

1960 25 24 19 32 24 30 23 30 40 58

1970 70 67 53 68 57 58 88 74 81 64

1980 78 84 76 61 59 50 51 58 35 39

1990 57 55 54 44 58 44 57 57 35 50

2000 26 43 48 40 42 37 20 34 63 72

2010 70 49 17 49 61 68

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1453B 1884 to 2015 132 years Series 32

[B] Entire series, effect on correlation ( .719) is:

Lower 1960< -.015 1972< -.015 1903> -.012 1984< -.010 1987> -.008 1952> -.007 Higher 1913 .029 1936 .016

1453B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1884 48 203 181 293 250 241

1890 297 306 389 331 364 299 434 310 250 230

1900 244 276 219 197 327 186 216 173 193 130

1910 140 163 117 35 65 80 103 114 61 154

1920 152 136 84 79 115 96 115 103 94 66

1930 76 63 96 68 97 96 44 47 66 72

1940 82 82 78 84 63 25 38 72 71 92

1950 87 87 88 73 47 60 80 73 57 51

1960 31 44 36 43 44 51 45 44 37 38

1970 71 60 49 69 63 57 71 65 72 65

1980 71 79 73 59 52 69 60 69 54 57

1990 72 64 64 57 79 61 62 69 71 72

2000 50 66 63 65 59 39 19 42 113 101

2010 110 64 51 107 126 102

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

1454A 1887 to 2015 129 years Series 33

[B] Entire series, effect on correlation ( .587) is:

Lower 1887< -.051 1959> -.014 1960< -.010 1904< -.010 1986> -.010 1954> -.010 Higher 1918 .029 1936 .024

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

1989 -1.452 37 2

2005 -1.478 37 2

2012 -2.112 37 7

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

1887 -4.7 SD

1454A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1887 93 180 182

1890 260 283 279 209 217 209 351 276 246 212

1900 216 243 159 85 71 57 74 110 141 103

1910 143 195 111 72 118 141 149 163 83 141

1920 233 196 206 162 209 195 188 166 132 122

1930 182 190 199 72 93 105 41 39 63 98

1940 75 117 144 157 106 75 104 171 167 149

1950 125 176 104 60 114 142 126 106 125 138

1960 78 77 51 85 70 59 65 116 92 100

1970 85 109 143 126 164 159 128 67 134 121

1980 137 103 142 93 167 157 145 61 25 0

1990 24 4 10 14 22 19 31 36 9 35

2000 57 56 43 38 33 0 3 12 47 25

2010 18 9 0 14 19 14

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

1454B 1890 to 2015 126 years Series 34

[B] Entire series, effect on correlation ( .557) is:

Lower 1913> -.023 1909< -.015 1918> -.013 1940> -.013 2012> -.013 1954> -.012 Higher 1903 .025 1936 .017

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

2005 -1.478 37 2

2006 -2.571 37 7

1454B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1890 317 385 441 287 168 159 252 183 120 102

1900 129 156 86 18 33 86 105 115 129 51

1910 57 161 154 117 152 182 205 223 189 198

1920 255 259 231 198 255 205 194 171 99 97

1930 140 153 158 70 105 137 85 101 160 123

1940 164 164 148 137 120 87 66 130 113 86

1950 134 186 115 88 143 138 118 125 141 126

1960 81 102 76 82 78 74 84 133 152 158

1970 178 169 236 193 208 170 113 70 163 101

1980 107 77 108 74 118 133 111 53 19 5

1990 14 20 26 30 36 24 33 35 14 31

2000 40 50 53 34 23 0 0 4 14 21

2010 23 7 8 28 23 19

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

1480A 1884 to 2015 132 years Series 35

[B] Entire series, effect on correlation ( .751) is:

Lower 1945> -.023 1935< -.012 1912> -.008 1918> -.007 1933> -.006 2004> -.006 Higher 1913 .024 1884 .014

1480A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1884 145 334 403 412 390 395

1890 318 327 324 321 253 200 286 165 154 115

1900 167 167 140 84 123 90 94 90 106 101

1910 103 153 137 49 85 83 100 106 82 114

1920 144 96 112 94 111 101 106 84 72 79

1930 104 114 148 97 127 69 48 79 80 64

1940 44 82 104 75 73 82 76 124 62 94

1950 112 128 98 76 52 87 82 73 100 44

1960 62 68 26 49 65 40 51 47 44 73

1970 84 71 114 86 98 95 103 102 99 108

1980 97 80 66 45 49 39 46 65 49 70

1990 93 72 104 74 83 61 106 99 77 73

2000 55 83 70 80 127 59 36 69 141 125

2010 103 73 30 103 90 88

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

1480B 1889 to 2015 127 years Series 36

[B] Entire series, effect on correlation ( .647) is:

Lower 1984< -.016 1989< -.015 1987> -.014 2003< -.014 1933> -.012 1968< -.011 Higher 1913 .043 2012 .015

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

2006 -2.571 37 7

2012 -2.112 37 7

1480B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1889 293

1890 256 248 272 280 294 223 310 206 151 139

1900 148 166 130 90 124 88 113 83 99 78

1910 85 110 69 19 49 66 83 57 38 65

1920 92 55 80 59 81 58 52 53 50 60

1930 91 92 83 66 60 58 29 38 24 41

1940 23 66 102 53 45 18 35 67 39 61

1950 59 92 74 71 42 62 41 38 41 40

1960 68 70 55 64 74 72 62 69 51 78

1970 86 83 123 90 80 90 96 100 100 102

1980 98 88 96 72 55 66 75 87 62 39

1990 61 54 59 61 52 46 50 60 52 66

2000 36 59 50 10 67 25 0 47 78 86

2010 73 57 0 40 57 59

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

1479B 1884 to 2015 132 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

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

1950 1999 -2 -.04 .01 -.09 -.22 -.15 -.10 .15 -.09 .46\* .06 .42| .28 .06 .08 .04 .09 -.10 .00 .12 -.04 -.25

[B] Entire series, effect on correlation ( .529) is:

Lower 1945> -.031 2006> -.022 1989< -.020 1997< -.013 1933> -.013 2014< -.010 Higher 1913 .028 1918 .028

1950 to 1999 segment:

Lower 1997< -.035 1965> -.025 1986> -.024 1988> -.022 1983> -.017 1995> -.014 Higher 1972 .024 1959 .023

[C] Year-to-year changes diverging by over 4.0 std deviations:

1988 1989 -4.2 SD

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

1989 -1.452 37 2

2014 .814 37 2 >> WARNING: Ring is not usually narrow

2015 1.156 37 2 >> WARNING: Ring is not usually narrow

>> WARNING: Last ring in series is ABSENT

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

1945 +3.4 SD; 1989 -5.8 SD; 2006 +3.1 SD

1479B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1884 169 240 271 317 274 231

1890 188 206 184 136 168 160 190 136 117 87

1900 106 96 47 46 62 60 52 51 46 53

1910 53 86 68 29 43 53 36 52 23 45

1920 71 54 78 62 80 66 85 76 86 66

1930 73 84 85 90 103 96 48 63 65 71

1940 59 96 131 144 114 128 65 102 65 82

1950 117 129 98 94 60 75 87 72 81 51

1960 100 68 56 63 35 68 48 59 52 60

1970 64 89 128 108 108 95 137 124 103 67

1980 61 46 61 62 64 50 59 15 26 0

1990 31 24 36 42 43 34 41 18 21 28

2000 14 29 28 22 21 5 26 32 37 34

2010 32 32 9 15 0 0

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

1479A 1886 to 2015 130 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

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

1950 1999 -2 -.11 -.08 -.01 -.15 -.02 -.03 .10 -.02 .36\* .08 .34| .04 .27 -.04 .00 .09 -.15 -.10 -.20 -.06 -.20

[B] Entire series, effect on correlation ( .530) is:

Lower 1988> -.019 2006< -.013 1933> -.011 1981< -.010 1953> -.008 1909> -.008 Higher 1936 .030 1913 .014

1950 to 1999 segment:

Lower 1988> -.059 1981< -.038 1953> -.028 1952> -.027 1994< -.022 1965> -.022 Higher 1966 .031 1972 .028

[C] Year-to-year changes diverging by over 4.0 std deviations:

2005 2006 -4.7 SD

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

2006 -2.571 37 7

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

2006 -7.2 SD

1479A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1886 308 349 357 266

1890 223 257 192 153 142 119 176 125 110 76

1900 77 64 35 28 48 42 43 50 41 54

1910 53 59 52 19 22 35 29 50 33 58

1920 93 52 70 60 95 73 77 106 87 65

1930 98 94 86 85 99 90 40 67 71 56

1940 46 64 90 70 72 59 51 72 39 70

1950 68 82 89 91 58 70 67 66 85 73

1960 72 59 55 72 32 60 35 43 34 45

1970 54 55 94 98 87 94 104 106 94 75

1980 87 57 87 83 80 89 76 64 89 90

1990 111 93 109 93 79 65 84 102 105 92

2000 63 70 56 58 63 51 0 31 45 45

2010 42 32 23 37 30 22

PART 7: DESCRIPTIVE STATISTICS: VMC1063\_ACSA\_Corr3-50 13:52 Wed 06 Apr 2016 Page 6

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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 1201A 1903 2015 113 4 0 .634 1.07 2.65 .455 .616 .289 2.61 .434 -.025 1

2 1201B 1894 2015 122 5 0 .617 1.16 3.60 .569 .729 .292 2.68 .461 .004 1

3 1202A 1895 2015 121 5 0 .662 .91 4.21 .555 .799 .251 2.78 .550 .080 1

4 1202B 1887 2015 129 5 0 .740 1.26 3.19 .656 .718 .353 2.54 .473 -.015 1

5 1203B 1889 2015 127 5 0 .618 1.29 4.64 .993 .883 .317 2.82 .508 .042 1

6 1203A 1890 2015 126 5 0 .692 1.26 3.94 .704 .871 .251 2.64 .542 -.026 1

7 1279A 1956 2015 60 2 0 .426 1.51 4.65 .861 .786 .225 2.56 .432 .040 1

8 1279B 1956 2015 60 2 0 .631 1.05 2.86 .480 .703 .294 2.83 .498 .124 1

9 1346A 1893 2015 123 5 0 .495 1.14 3.36 .709 .845 .325 2.48 .290 .029 1

10 1346B 1885 2015 131 5 0 .636 1.37 4.34 .897 .844 .330 2.67 .383 .033 1

11 1347A 1887 2015 129 5 0 .503 .98 4.48 .618 .872 .272 2.54 .384 .015 1

12 1347B 1890 2015 126 5 0 .599 1.35 3.78 .626 .791 .256 2.43 .351 .015 1

13 1348A 1894 2015 122 5 0 .749 1.40 2.98 .602 .753 .307 2.47 .385 .050 1

14 1348B 1890 2015 126 5 0 .719 1.13 2.23 .473 .775 .291 2.35 .342 -.010 3

15 1349B 1892 2015 124 5 0 .668 .98 3.84 .816 .912 .291 2.59 .377 .031 1

16 1350A 1886 2015 130 5 0 .614 1.30 3.48 .616 .736 .294 2.58 .345 -.017 1

17 1350B 1961 2015 55 2 0 .567 1.04 2.69 .588 .763 .303 2.56 .619 .015 1

18 1351A 1891 1985 95 4 0 .608 1.32 5.17 1.166 .914 .325 2.63 .381 .119 1

19 1352A 1896 2015 120 5 0 .764 1.25 3.55 .617 .885 .202 2.60 .496 .097 1

20 1352B 1891 2015 125 5 0 .642 1.22 4.46 .763 .864 .291 2.49 .339 -.015 1

21 1353A 1894 2015 122 5 0 .641 1.32 3.17 .528 .712 .263 2.80 .481 .047 1

22 1353B 1906 2015 110 4 0 .771 1.58 3.24 .556 .680 .243 2.67 .443 .001 1

23 1397A 1895 2015 121 5 2 .507 1.44 3.25 .669 .708 .286 2.44 .315 -.019 1

24 1397B 1897 2015 119 5 0 .625 1.13 3.13 .671 .822 .266 2.57 .378 -.075 1

25 1450A 1887 2015 129 5 0 .645 1.31 3.61 .611 .796 .269 2.64 .436 -.043 1

26 1450B 1883 2015 133 5 0 .654 1.14 2.91 .486 .802 .237 2.71 .456 .014 1

27 1451A 1889 2015 127 5 0 .535 .98 2.66 .394 .698 .278 2.51 .393 .008 1

28 1451B 1886 2015 130 5 0 .578 1.45 4.25 .689 .822 .226 2.64 .383 -.040 1

29 1452A 1890 2015 126 5 0 .707 1.08 2.85 .578 .885 .208 2.60 .396 -.063 1

30 1452B 1892 2015 124 5 0 .641 .93 3.08 .450 .807 .255 2.60 .494 -.003 1

31 1453A 1887 2015 129 5 0 .701 1.11 4.34 .998 .934 .244 2.62 .407 .013 1

32 1453B 1884 2015 132 5 0 .719 1.08 4.34 .843 .891 .241 2.61 .442 .072 1

33 1454A 1887 2015 129 5 0 .587 1.13 3.50 .722 .842 .412 2.65 .499 -.003 2

34 1454B 1890 2015 126 5 0 .557 1.17 4.41 .790 .864 .346 2.53 .410 .013 3

35 1480A 1884 2015 132 5 0 .751 1.10 4.12 .778 .890 .272 2.52 .391 -.031 1

36 1480B 1889 2015 127 5 0 .647 .82 3.10 .586 .891 .345 2.64 .375 .036 1

37 1479B 1884 2015 132 5 1 .529 .78 3.17 .564 .910 .319 2.62 .428 -.063 1

38 1479A 1886 2015 130 5 1 .530 .80 3.57 .565 .916 .259 2.30 .275 -.012 1

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Total or mean: 4542 178 4 .633 1.16 5.17 .663 .818 .283 2.83 .416 .009

- = [ COFECHA RSSM3COF ] = -