[] Dendrochronology Program Library Run 812 Program COF 11:18 Mon 08 Jan 2018 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 30325

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: VMC812\_TSCA\_corr1-50

File of DATED series: VMC812\_TSCA\_corr1.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 1903 to 2015 113 years

Continuous time span is 1903 to 2015 113 years

Portion with two or more series is 1904 to 2015 112 years

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

\*C\* Number of dated series 31 \*C\*

\*O\* Master series 1903 2015 113 yrs \*O\*

\*F\* Total rings in all series 2906 \*F\*

\*E\* Total dated rings checked 2905 \*E\*

\*C\* Series intercorrelation .602 \*C\*

\*H\* Average mean sensitivity .234 \*H\*

\*A\* Segments, possible problems 2 \*A\*

\*\*\* Mean length of series 93.7 \*\*\*

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

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

1208A 1 absent rings: 2011

1210B 1 absent rings: 1989

2 absent rings .069%

PART 2: TIME PLOT OF TREE-RING SERIES: VMC812\_TSCA\_corr1-50 11:18 Mon 08 Jan 2018 Page 2

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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

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

. . . . . . . . . . . . . . . . . . <======> . 1205B 1 1947 2015 69

. . . . . . . . . . . . . . . . . . <=======> . 1208A 2 1935 2015 81

. . . . . . . . . . . . . . . . . .<=========> . 1208B 3 1919 2015 97

. . . . . . . . . . . . . . . . . .<=========> . 1209A 4 1912 2015 104

. . . . . . . . . . . . . . . . . <==========> . 1209B 5 1906 2015 110

. . . . . . . . . . . . . . . . . <==========> . 1210A 6 1906 2015 110

. . . . . . . . . . . . . . . . . .<=========> . 1210B 7 1913 2015 103

. . . . . . . . . . . . . . . . . <==========> . 1211A 8 1905 2015 111

. . . . . . . . . . . . . . . . . <==========> . 1211B 9 1906 2015 110

. . . . . . . . . . . . . . . . . .<=========> . 1212A 10 1914 2015 102

. . . . . . . . . . . . . . . . . .<=========> . 1212B 11 1916 2015 100

. . . . . . . . . . . . . . . . . .<=========> . 1213A 12 1913 2015 103

. . . . . . . . . . . . . . . . . .<=========> . 1213B 13 1918 2015 98

. . . . . . . . . . . . . . . . . . <========> . 1214A 14 1922 2015 94

. . . . . . . . . . . . . . . . . <==========> . 1214B 15 1905 2015 111

. . . . . . . . . . . . . . . . . . <========> . 1215A 16 1924 2015 92

. . . . . . . . . . . . . . . . . <==========> . 1215B 17 1906 2015 110

. . . . . . . . . . . . . . . . . <==========> . 1216A 18 1904 2015 112

. . . . . . . . . . . . . . . . . . <======> . 1216B 19 1943 2015 73

. . . . . . . . . . . . . . . . . . <=======> . 1217A 20 1939 2015 77

. . . . . . . . . . . . . . . . . . <=====> . 1217B 21 1957 2015 59

. . . . . . . . . . . . . . . . . . <=====> . 1218A 22 1957 2015 59

. . . . . . . . . . . . . . . . . . <======> . 1218B 23 1947 2015 69

. . . . . . . . . . . . . . . . . . <======> . 1219A 24 1947 2015 69

. . . . . . . . . . . . . . . . . . <======> . 1219B 25 1946 2015 70

. . . . . . . . . . . . . . . . . <==========> . 1220A 26 1903 2015 113

. . . . . . . . . . . . . . . . . <==========> . 1220B 27 1907 2015 109

. . . . . . . . . . . . . . . . . . <=======> . 1221A 28 1930 2015 86

. . . . . . . . . . . . . . . . . .<=========> . 1221B 29 1915 2015 101

. . . . . . . . . . . . . . . . . .<=========> . 1222A 30 1913 2015 103

. . . . . . . . . . . . . . . . . .<=========> . 1222B 31 1915 2015 101

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

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: VMC812\_TSCA\_corr1-50 11:18 Mon 08 Jan 2018 Page 3

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

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1950 -1.235 29 2000 -.558 31

1951 .594 29 2001 .607 31

1952 .529 29 2002 .141 31

1903 -2.166 1 1953 -.572 29 2003 -1.912 31

1904 -3.219 2 1954 1.059 29 2004 -.570 31

1905 .620 4 1955 1.595 29 2005 .356 31

1906 .762 8 1956 .911 29 2006 .079 31

1907 -.251 9 1957 1.430 31 2007 .168 31

1908 -.678 9 1958 1.020 31 2008 -.134 31

1909 -.380 9 1959 .283 31 2009 -.436 31

1910 .851 9 1960 -.247 31 2010 1.486 31

1911 .673 9 1961 1.570 31 2011 -.620 31 1

1912 .236 10 1962 -.184 31 2012 1.944 31

1913 .465 13 1963 -1.204 31 2013 .914 31

1914 .184 14 1964 -1.246 31 2014 -.147 31

1915 1.208 16 1965 .474 31 2015 -1.477 31

1916 1.408 17 1966 .311 31

1917 -.263 17 1967 1.338 31

1918 -1.186 18 1968 .079 31

1919 -.151 19 1969 -1.052 31

1920 .020 19 1970 -.936 31

1921 .789 19 1971 .102 31

1922 .667 20 1972 -1.085 31

1923 -1.729 20 1973 1.477 31

1924 .391 21 1974 -.422 31

1925 .461 21 1975 -1.024 31

1926 -.882 21 1976 -1.311 31

1927 .408 21 1977 .580 31

1928 .426 21 1978 .631 31

1929 -.317 21 1979 .366 31

1930 .174 22 1980 .920 31

1931 -.415 22 1981 -2.952 31

1932 .003 22 1982 -.649 31

1933 -.187 22 1983 .278 31

1934 -1.060 22 1984 -1.365 31

1935 .264 23 1985 1.429 31

1936 .468 23 1986 1.264 31

1937 1.652 23 1987 1.182 31

1938 .468 23 1988 .523 31

1939 .785 24 1989 -.578 31 1

1940 .364 24 1990 .338 31

1941 .664 24 1991 .198 31

1942 .250 24 1992 1.104 31

1943 .090 25 1993 -.366 31

1944 -1.034 25 1994 -1.009 31

1945 -.626 25 1995 1.260 31

1946 -.702 26 1996 .509 31

1947 -.189 29 1997 -.024 31

1948 -3.440 29 1998 -.692 31

1949 -.826 29 1999 -.091 31

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PART 4: Master Bar Plot: VMC812\_TSCA\_corr1-50 11:18 Mon 08 Jan 2018 Page 4

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

1950-e 2000--b

1951--------B 2001--------B

1952-------B 2002-----A

1903i 1953--b 2003h

1904m 1954---------D 2004--b

1905--------B 1955----------F 2005------A

1906--------C 1956---------D 2006-----@

1907---a 1957----------F 2007-----A

1908--c 1958---------D 2008----a

1909---b 1959------A 2009---b

1910--------C 1960----a 2010----------F

1911--------C 1961----------F 2011--b

1912-----A 1962----a 2012----------H

1913-------B 1963-e 2013---------D

1914-----A 1964-e 2014----a

1915---------E 1965-------B 2015f

1916----------F 1966------A

1917---a 1967----------E

1918-e 1968-----@

1919----a 1969-d

1920-----@ 1970-d

1921--------C 1971-----@

1922--------C 1972-d

1923g 1973----------F

1924------B 1974---b

1925-------B 1975-d

1926-d 1976-e

1927------B 1977--------B

1928-------B 1978--------C

1929---a 1979------A

1930-----A 1980---------D

1931---b 1981l

1932----@ 1982--c

1933----a 1983------A

1934-d 1984-e

1935------A 1985----------F

1936-------B 1986---------E

1937----------G 1987---------E

1938-------B 1988-------B

1939--------C 1989--b

1940------A 1990------A

1941--------C 1991-----A

1942-----A 1992---------D

1943-----@ 1993---a

1944-d 1994-d

1945--c 1995---------E

1946--c 1996-------B

1947----a 1997----@

1948n 1998--c

1949--c 1999----@

PART 5: CORRELATION OF SERIES BY SEGMENTS: VMC812\_TSCA\_corr1-50 11:18 Mon 08 Jan 2018 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 1900 1925 1950 1975

1949 1974 1999 2024

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

1 1205B 1947 2015 .60 .61 .51

2 1208A 1935 2015 .55 .54 .47

3 1208B 1919 2015 .50 .53 .66 .68

4 1209A 1912 2015 .63 .64 .68 .58

5 1209B 1906 2015 .38 .53 .71 .61

6 1210A 1906 2015 .44 .62 .55 .59

7 1210B 1913 2015 .51 .63 .80 .82

8 1211A 1905 2015 .50 .59 .57 .62

9 1211B 1906 2015 .49 .66 .69 .64

10 1212A 1914 2015 .63 .72 .74 .67

11 1212B 1916 2015 .65 .70 .77 .72

12 1213A 1913 2015 .69 .68 .77 .77

13 1213B 1918 2015 .52 .52 .70 .65

14 1214A 1922 2015 .70 .69 .80 .83

15 1214B 1905 2015 .48 .65 .74 .75

16 1215A 1924 2015 .72 .72 .81 .73

17 1215B 1906 2015 .63 .71 .70 .61

18 1216A 1904 2015 .50 .52 .41 .50

19 1216B 1943 2015 .56 .53 .53

20 1217A 1939 2015 .71 .72 .70

21 1217B 1957 2015 .64 .60

22 1218A 1957 2015 .37B .46

23 1218B 1947 2015 .47 .62 .68

24 1219A 1947 2015 .69 .66 .53

25 1219B 1946 2015 .70 .63 .61

26 1220A 1903 2015 .73 .69 .64 .49

27 1220B 1907 2015 .61 .55 .32A .39

28 1221A 1930 2015 .44 .50 .52

29 1221B 1915 2015 .56 .69 .76 .78

30 1222A 1913 2015 .78 .80 .80 .81

31 1222B 1915 2015 .73 .76 .75 .77

Av segment correlation .59 .63 .65 .63

PART 6: POTENTIAL PROBLEMS: VMC812\_TSCA\_corr1-50 11:18 Mon 08 Jan 2018 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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1205B 1947 to 2015 69 years Series 1

[B] Entire series, effect on correlation ( .543) is:

Lower 1995< -.035 2009> -.017 1967< -.015 1984< -.010 1948> -.010 1972> -.009 Higher 1981 .031 2012 .017

1205B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1947 308 231 238

1950 251 310 319 288 715 767 691 653 547 477

1960 452 501 386 291 273 331 313 275 222 208

1970 222 275 268 338 226 227 219 253 250 215

1980 206 137 117 169 92 185 191 170 153 119

1990 137 118 170 162 137 116 134 118 106 134

2000 160 213 171 175 232 206 225 260 254 325

2010 302 259 345 279 210 211

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

1208A 1935 to 2015 81 years Series 2

[B] Entire series, effect on correlation ( .502) is:

Lower 1939< -.022 1965< -.020 1974> -.019 1975> -.019 1944> -.019 2003> -.015 Higher 1948 .068 1973 .015

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

2011 -.620 31 1

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

2011 -4.8 SD

1208A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1935 457 373 588 684 406

1940 568 654 595 688 701 614 464 522 179 300

1950 229 524 477 280 402 465 269 347 204 146

1960 120 216 113 67 68 37 97 122 103 60

1970 54 66 39 123 123 124 75 110 78 47

1980 71 34 53 77 57 85 51 47 50 43

1990 38 62 45 35 26 80 45 72 42 117

2000 116 186 236 142 124 153 75 123 105 48

2010 72 0 43 46 38 6

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

1208B 1919 to 2015 97 years Series 3

[B] Entire series, effect on correlation ( .592) is:

Lower 1939< -.025 1919< -.020 1944> -.013 1931> -.012 1950< -.011 1974> -.009 Higher 1948 .026 1923 .013

1208B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1919 187

1920 271 325 419 299 365 625 460 521 553 462

1930 630 731 593 472 424 817 560 732 627 466

1940 646 758 654 710 690 732 615 702 404 393

1950 300 494 503 405 549 650 486 537 470 451

1960 511 513 324 242 199 261 262 267 248 155

1970 136 142 72 210 183 131 97 127 179 132

1980 282 88 110 126 70 154 248 229 195 163

1990 193 187 144 101 86 133 134 123 120 145

2000 127 191 204 125 143 252 153 186 151 107

2010 170 133 211 169 142 96

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1209A 1912 to 2015 104 years Series 4

[B] Entire series, effect on correlation ( .606) is:

Lower 1934> -.028 2003> -.014 1993> -.012 2005< -.011 1924< -.009 1931> -.008 Higher 1948 .066 1981 .015

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

1934 +3.3 SD

1209A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1912 553 759 644 660 659 567 451 529

1920 652 619 544 414 428 402 405 420 466 415

1930 415 452 451 393 458 396 352 362 327 366

1940 322 359 351 327 257 220 255 293 169 217

1950 178 216 207 146 154 179 161 152 114 104

1960 74 115 71 62 72 80 81 86 66 52

1970 45 43 39 59 44 27 33 63 44 56

1980 71 32 44 38 31 69 53 66 73 61

1990 55 77 80 79 58 62 57 52 44 62

2000 49 74 59 60 44 43 72 95 70 71

2010 97 60 64 69 40 23

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1209B 1906 to 2015 110 years Series 5

[B] Entire series, effect on correlation ( .517) is:

Lower 1930< -.044 2011> -.034 1910< -.016 1993> -.015 1945< -.013 1914> -.012 Higher 1981 .078 1948 .033

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

1930 -5.7 SD

1209B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1906 347 296 213 215

1910 209 237 333 410 852 613 618 556 328 507

1920 543 516 427 353 438 438 371 364 421 317

1930 263 301 303 369 337 336 291 278 242 297

1940 248 288 262 246 217 144 187 225 130 171

1950 110 143 152 94 106 190 145 154 115 136

1960 92 147 57 37 52 63 57 72 48 45

1970 44 48 26 56 31 18 30 42 27 16

1980 26 10 17 19 15 22 33 36 25 22

1990 31 41 41 61 47 69 64 80 70 73

2000 57 80 57 34 31 44 43 49 38 24

2010 97 343 357 101 37 26

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1210A 1906 to 2015 110 years Series 6

[B] Entire series, effect on correlation ( .540) is:

Lower 1989< -.104 1913< -.016 1916< -.011 1912< -.010 1937< -.008 1986< -.007 Higher 1981 .051 1948 .024

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

1988 1989 -4.6 SD 1989 1990 4.1 SD

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

1989 -7.4 SD

1210A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1906 626 463 485 455

1910 470 523 297 223 232 325 262 258 250 273

1920 326 293 297 210 253 198 190 219 224 213

1930 190 176 160 128 127 173 113 93 91 76

1940 65 62 54 54 26 54 52 60 8 75

1950 34 114 105 177 270 263 227 294 342 251

1960 243 367 255 210 193 204 182 239 179 178

1970 187 223 206 270 203 172 157 194 233 238

1980 243 90 148 222 139 151 116 141 152 25

1990 111 140 149 101 91 112 115 101 89 107

2000 75 73 74 45 54 79 63 82 78 72

2010 110 67 82 68 63 29

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

1210B 1913 to 2015 103 years Series 7

[B] Entire series, effect on correlation ( .600) is:

Lower 1989< -.087 1933< -.013 1998> -.008 1923> -.007 2010< -.007 1920> -.007 Higher 1981 .067 1948 .016

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

1989 -.578 31 1

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

1989 -7.3 SD

1210B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1913 276 248 303 370 320 294 279

1920 347 290 295 237 236 202 201 224 205 182

1930 193 136 137 96 106 128 111 109 110 149

1940 101 83 94 89 68 55 61 62 10 24

1950 59 171 196 158 333 246 205 233 213 163

1960 188 247 228 199 187 200 236 283 174 157

1970 146 176 126 157 134 139 99 117 130 135

1980 142 46 94 93 54 90 75 75 66 0

1990 60 67 73 43 48 100 82 90 94 117

2000 73 67 70 29 44 71 56 79 61 55

2010 65 45 203 103 60 27

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1211A 1905 to 2015 111 years Series 8

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

Lower 1981> -.044 1944> -.024 1917< -.019 1923> -.014 1950> -.012 1993> -.012 Higher 1948 .073 2003 .017

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

1905 +3.1 SD

1211A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1905 644 446 408 374 388

1910 387 308 237 258 116 237 242 28 30 104

1920 133 162 202 119 152 177 108 138 69 47

1930 92 40 104 96 99 108 120 104 95 100

1940 120 104 126 130 221 98 104 128 12 146

1950 264 418 303 170 236 312 225 297 289 266

1960 223 426 346 313 265 499 381 402 360 301

1970 336 349 194 316 198 194 163 315 343 298

1980 370 273 265 345 214 364 312 241 243 225

1990 245 205 269 251 165 204 161 137 92 106

2000 87 114 100 55 69 74 66 99 82 90

2010 152 88 176 222 219 108

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1211B 1906 to 2015 110 years Series 9

[B] Entire series, effect on correlation ( .574) is:

Lower 1917< -.050 2003> -.011 1926> -.010 1975> -.010 1911< -.009 2006< -.008 Higher 1981 .029 1948 .019

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

1917 -5.1 SD; 1918 -4.5 SD

1211B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1906 573 434 363 336

1910 375 251 252 267 196 196 204 44 35 116

1920 186 185 192 109 127 72 90 102 93 80

1930 72 51 69 104 88 105 120 126 110 116

1940 98 80 74 95 48 82 70 96 17 116

1950 191 427 261 172 318 434 299 434 313 199

1960 139 262 191 182 124 194 182 225 193 217

1970 246 275 200 344 189 250 165 331 293 245

1980 242 126 208 185 112 163 186 171 140 143

1990 147 104 114 93 105 142 109 144 135 182

2000 149 318 285 214 171 209 132 266 255 276

2010 325 160 384 249 312 182

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1212A 1914 to 2015 102 years Series 10

[B] Entire series, effect on correlation ( .635) is:

Lower 1923< -.027 1917> -.017 1932< -.010 2011> -.009 1971< -.008 1994> -.007 Higher 1981 .038 1948 .020

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

1923 -4.7 SD

1212A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1914 484 507 483 463 405 343

1920 356 337 293 222 246 253 234 224 214 188

1930 181 155 135 148 161 170 168 232 173 181

1940 180 170 130 142 150 165 158 192 122 219

1950 244 374 441 356 485 468 383 402 395 372

1960 306 369 281 240 227 380 317 351 334 285

1970 275 232 235 345 275 234 216 334 295 261

1980 242 136 153 185 183 224 228 233 165 170

1990 217 166 179 134 172 270 288 219 158 161

2000 171 177 233 191 149 149 172 168 167 132

2010 222 220 281 229 164 130

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1212B 1916 to 2015 100 years Series 11

[B] Entire series, effect on correlation ( .684) is:

Lower 2003> -.019 1917> -.014 1972> -.011 1975> -.011 1919> -.008 1999< -.007 Higher 1981 .073 2012 .011

1212B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1916 402 364 327 349

1920 289 294 268 228 248 186 176 174 144 132

1930 140 94 103 77 71 109 115 148 125 122

1940 76 97 82 74 63 85 91 90 60 109

1950 116 169 195 177 266 378 341 376 328 283

1960 253 302 220 176 157 223 194 248 168 179

1970 177 211 205 210 151 194 130 178 177 169

1980 183 77 138 165 140 193 180 166 164 155

1990 180 147 157 100 133 149 158 119 110 95

2000 91 95 114 112 109 116 129 112 105 95

2010 152 105 217 177 124 104

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1213A 1913 to 2015 103 years Series 12

[B] Entire series, effect on correlation ( .732) is:

Lower 1999< -.018 1931> -.014 1989> -.011 2010< -.008 1938< -.007 1913< -.007 Higher 1981 .062 1923 .009

1213A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1913 355 451 496 424 347 307 336

1920 305 354 321 228 335 303 251 260 255 263

1930 279 291 237 202 189 241 227 267 180 214

1940 189 196 184 190 159 138 127 147 94 134

1950 109 134 151 154 176 324 329 396 329 268

1960 188 321 208 193 195 209 199 209 143 122

1970 124 107 89 109 86 66 62 68 74 68

1980 77 16 67 55 40 97 93 103 92 93

1990 95 82 77 57 54 83 74 75 72 39

2000 45 57 48 31 43 58 48 53 51 68

2010 73 64 159 170 116 58

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1213B 1918 to 2015 98 years Series 13

[B] Entire series, effect on correlation ( .559) is:

Lower 1944< -.049 2011> -.022 1999< -.019 1948> -.018 1989> -.016 1925> -.009 Higher 1981 .047 1923 .017

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

1944 -4.8 SD

1213B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1918 343 339

1920 316 338 335 231 282 387 204 220 199 200

1930 230 168 173 138 166 192 181 207 128 156

1940 120 127 120 141 66 135 156 215 153 167

1950 131 189 185 171 191 278 274 352 241 195

1960 182 249 139 160 192 213 181 199 169 110

1970 110 146 126 156 104 88 109 118 124 126

1980 110 49 77 69 61 113 111 120 127 129

1990 102 88 94 78 66 89 68 76 66 44

2000 52 61 58 48 44 49 56 56 37 31

2010 96 103 102 92 80 38

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

1214A 1922 to 2015 94 years Series 14

[B] Entire series, effect on correlation ( .773) is:

Lower 1926> -.025 1993> -.014 1952< -.012 1931> -.010 1954< -.009 1977< -.007 Higher 1981 .054 1948 .021

1214A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1922 376 284 312 337 344 318 312 263

1930 294 303 296 261 212 261 248 288 201 199

1940 195 232 178 177 152 212 184 213 109 195

1950 178 208 154 168 213 395 416 402 398 375

1960 367 414 297 237 198 300 275 348 270 215

1970 225 200 141 225 159 130 111 121 122 128

1980 131 60 94 109 88 138 123 113 104 95

1990 99 106 122 112 73 90 85 72 69 85

2000 66 72 77 62 71 84 70 74 88 107

2010 146 79 116 131 106 87

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1214B 1905 to 2015 111 years Series 15

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

Lower 1989> -.019 1905< -.017 1921< -.014 1938< -.013 2014< -.012 1996< -.007 Higher 1981 .076 1948 .016

1214B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1905 68 97 86 81 91

1910 161 182 253 307 340 415 387 366 333 335

1920 374 292 310 263 353 290 281 292 275 232

1930 233 218 226 231 220 237 283 298 199 224

1940 234 212 210 182 136 149 146 149 69 115

1950 122 136 110 129 144 305 377 409 378 426

1960 343 348 239 210 187 272 232 261 206 142

1970 140 114 90 152 115 110 94 89 91 101

1980 101 52 81 96 81 142 109 109 103 126

1990 115 101 101 88 68 105 73 75 80 79

2000 71 100 83 72 79 84 92 93 94 103

2010 143 103 121 102 76 87

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

1215A 1924 to 2015 92 years Series 16

[B] Entire series, effect on correlation ( .706) is:

Lower 1934< -.018 1975> -.013 1953> -.011 2008< -.009 1926< -.008 1992< -.007 Higher 1981 .054 1948 .028

1215A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1924 185 186 143 151 148 144

1930 166 146 143 161 100 129 152 199 130 131

1940 123 118 128 111 96 126 102 76 5 34

1950 55 125 216 315 391 412 400 422 366 331

1960 287 282 218 190 198 284 286 321 263 208

1970 226 266 210 311 234 270 220 356 248 236

1980 253 164 196 220 174 241 278 213 194 152

1990 184 164 163 156 176 278 216 198 168 198

2000 167 156 119 110 184 222 206 131 81 68

2010 158 136 196 170 165 133

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

1215B 1906 to 2015 110 years Series 17

[B] Entire series, effect on correlation ( .610) is:

Lower 2008< -.039 1983< -.018 2009< -.017 2011> -.013 1906< -.008 1923> -.008 Higher 1981 .034 1948 .013

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

2009 -5.2 SD

1215B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1906 77 89 73 63

1910 165 302 216 233 151 178 189 155 96 120

1920 140 113 103 96 114 113 95 120 106 73

1930 69 48 51 53 34 70 98 130 107 122

1940 101 90 97 80 56 48 31 28 5 55

1950 45 71 166 136 132 180 169 223 193 212

1960 120 175 128 149 137 234 170 219 149 96

1970 114 153 107 169 139 139 129 172 153 122

1980 119 68 90 62 55 122 137 166 127 82

1990 108 77 106 75 69 120 109 130 95 83

2000 83 91 93 68 107 114 131 93 47 30

2010 87 95 140 107 98 72

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

1216A 1904 to 2015 112 years Series 18

[B] Entire series, effect on correlation ( .492) is:

Lower 1981> -.067 1923> -.019 1955< -.014 1935< -.012 1989< -.011 1962> -.007 Higher 1904 .019 2012 .012

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

1981 +3.6 SD

1216A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1904 201 303 361 286 334 372

1910 480 392 427 439 396 507 374 322 211 243

1920 195 227 196 202 220 194 122 153 130 136

1930 147 99 91 80 61 52 62 82 81 93

1940 99 78 82 86 60 62 68 94 68 137

1950 157 301 428 350 445 244 160 272 288 201

1960 265 341 324 209 197 263 219 287 181 183

1970 185 228 200 300 167 169 129 250 296 286

1980 323 302 288 357 261 329 301 315 225 102

1990 126 132 236 203 136 182 218 199 171 131

2000 127 139 121 104 119 132 158 112 73 85

2010 157 82 154 129 106 63

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1216B 1943 to 2015 73 years Series 19

[B] Entire series, effect on correlation ( .593) is:

Lower 1981> -.074 1989< -.015 1966< -.013 2011> -.010 1990< -.009 1978< -.009 Higher 1948 .020 1973 .014

1216B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1943 69 62 67 64 76 12 75

1950 194 380 433 245 405 570 365 435 369 366

1960 291 390 233 155 160 238 163 285 235 226

1970 239 307 264 375 204 188 132 322 197 163

1980 235 195 202 256 184 205 200 191 146 81

1990 91 108 108 97 82 113 109 97 82 72

2000 63 91 88 47 84 96 109 115 82 68

2010 130 118 167 174 122 93

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1217A 1939 to 2015 77 years Series 20

[B] Entire series, effect on correlation ( .696) is:

Lower 1984> -.017 1976> -.013 2005< -.012 1986< -.011 1968> -.010 1987< -.010 Higher 1981 .091 2012 .015

1217A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1939 294

1940 272 256 192 157 121 184 116 101 80 132

1950 102 144 149 156 202 157 163 167 187 127

1960 134 213 152 143 147 202 207 218 210 136

1970 118 136 117 132 97 76 123 149 134 129

1980 149 68 127 115 128 156 125 120 129 108

1990 125 171 214 136 155 258 258 237 186 213

2000 230 246 214 183 186 162 170 219 193 166

2010 250 201 366 200 193 123

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1217B 1957 to 2015 59 years Series 21

[B] Entire series, effect on correlation ( .622) is:

Lower 1975< -.036 2003> -.026 2009> -.020 1984> -.017 1987< -.014 1980< -.011 Higher 1981 .094 1961 .015

1217B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1957 310 306 271

1960 219 373 257 211 221 336 289 300 279 243

1970 239 274 210 286 198 126 181 199 188 159

1980 152 107 136 142 165 229 234 167 171 150

1990 174 193 261 205 196 248 219 218 218 234

2000 214 238 228 235 251 265 231 280 280 314

2010 272 180 252 216 181 187

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

1218A 1957 to 2015 59 years Series 22

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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

1957 2006 7 -.14 .06 -.03 .13 .06 .10 -.07 -.09 -.05 -.31 .37| .27 .03 -.19 -.06 -.03 .14 .37\*-.14 -.03 -

[B] Entire series, effect on correlation ( .436) is:

Lower 1996< -.091 2003> -.043 1957< -.035 1994> -.020 1980< -.018 1984> -.018 Higher 1981 .082 2011 .023

1957 to 2006 segment:

Lower 1996< -.101 2003> -.048 1957< -.040 1994> -.022 1980< -.021 1984> -.018 Higher 1981 .122 1985 .025

1218A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1957 284 355 306

1960 374 378 276 261 260 301 326 266 224 197

1970 150 188 171 190 149 138 154 159 177 172

1980 142 111 160 158 160 204 202 187 147 138

1990 176 169 193 146 190 220 59 64 63 85

2000 122 137 101 163 202 216 180 189 201 128

2010 195 119 187 167 157 139

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1218B 1947 to 2015 69 years Series 23

[B] Entire series, effect on correlation ( .501) is:

Lower 1947< -.059 1948> -.058 1996< -.029 1952< -.014 1957< -.014 1964> -.013 Higher 1981 .128 2012 .022

1218B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1947 84 160 214

1950 228 278 206 243 383 412 300 274 341 374

1960 398 417 314 299 344 357 321 284 301 237

1970 208 235 233 305 237 220 213 215 225 255

1980 236 169 227 263 255 292 307 284 326 234

1990 279 315 358 259 247 309 154 169 135 163

2000 154 171 158 159 200 218 176 238 244 215

2010 227 179 271 214 204 175

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1219A 1947 to 2015 69 years Series 24

[B] Entire series, effect on correlation ( .595) is:

Lower 2007< -.100 1974> -.033 1989> -.019 1975> -.007 1982< -.006 1992< -.006 Higher 1981 .049 2003 .025

1219A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1947 628 471 492

1950 440 517 542 421 505 492 504 512 441 406

1960 416 526 369 274 292 282 257 286 219 132

1970 127 160 103 168 239 181 151 145 135 127

1980 132 67 73 101 91 205 163 181 161 186

1990 189 142 133 133 129 158 144 130 137 142

2000 133 125 134 108 111 127 126 96 116 104

2010 118 108 154 143 127 111

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1219B 1946 to 2015 70 years Series 25

[B] Entire series, effect on correlation ( .648) is:

Lower 1991< -.029 2011> -.017 1996> -.015 2002< -.014 1976> -.014 2000> -.011 Higher 1981 .044 1948 .034

1219B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1946 747 852 620 800

1950 701 717 743 577 738 672 525 511 430 361

1960 280 394 295 238 235 213 204 221 173 112

1970 101 130 133 189 140 127 138 129 152 155

1980 149 87 122 148 114 163 136 138 137 123

1990 134 111 144 140 126 143 180 143 144 149

2000 171 155 137 122 170 186 179 153 194 169

2010 220 207 259 239 165 124

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1220A 1903 to 2015 113 years Series 26

[\*] Early part of series cannot be checked from 1903 to 1903 -- not matched by another series

[B] Entire series, effect on correlation ( .549) is:

Lower 2011< -.114 1904> -.011 2015> -.010 1988< -.010 2008> -.006 1977< -.006 Higher 2012 .009 2010 .008

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

2010 2011 -4.0 SD

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

2011 -5.9 SD

1220A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1903 231 215 295 319 301 278 299

1910 345 326 290 283 277 287 288 202 161 135

1920 121 147 135 100 113 88 65 85 75 54

1930 51 41 47 56 42 68 83 130 125 130

1940 116 100 88 83 64 57 61 67 38 92

1950 83 140 118 89 159 156 115 142 130 79

1960 58 84 85 52 57 68 91 120 67 54

1970 41 38 47 62 62 37 34 40 51 56

1980 81 52 58 76 70 103 118 133 80 82

1990 87 99 113 90 83 100 101 104 84 129

2000 118 135 116 90 96 111 91 112 153 137

2010 178 32 131 123 100 123

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

1220B 1907 to 2015 109 years Series 27

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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

1950 1999 0 .21 -.19 -.08 .09 -.22 -.01 -.18 .12 -.13 .04 .32\*-.13 .14 .02 .18 .11 .29 -.07 -.21 .02 -.11

[B] Entire series, effect on correlation ( .453) is:

Lower 1981> -.056 1977< -.024 1993> -.012 1969> -.011 1989> -.010 1972> -.008 Higher 1948 .020 1923 .014

1950 to 1999 segment:

Lower 1981> -.089 1977< -.071 1993> -.028 1969> -.024 1989> -.022 1978< -.017 Higher 1984 .046 1985 .026

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

2003 -6.4 SD

1220B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1907 270 236 260

1910 316 281 284 236 189 213 230 152 143 104

1920 80 89 129 74 84 114 85 91 92 76

1930 51 65 47 42 31 38 47 95 122 109

1940 94 77 73 71 54 52 48 69 29 112

1950 122 183 183 131 219 185 192 201 162 116

1960 102 115 103 106 110 130 126 139 103 117

1970 90 105 106 102 100 65 67 51 59 64

1980 94 103 100 138 92 139 140 164 126 150

1990 164 127 137 163 126 156 150 139 133 149

2000 137 117 133 44 98 143 113 123 127 157

2010 207 64 112 144 104 90

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1221A 1930 to 2015 86 years Series 28

[B] Entire series, effect on correlation ( .501) is:

Lower 1976< -.021 1955< -.018 1935< -.017 1962> -.011 1972> -.011 1951< -.010 Higher 1948 .047 2012 .020

1221A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1930 227 255 265 247 165 94 145 203 179 172

1940 106 123 141 81 46 121 155 152 31 84

1950 99 108 118 88 122 98 132 157 165 137

1960 112 156 156 119 107 153 141 149 135 113

1970 122 156 141 136 96 111 86 135 136 128

1980 126 100 124 135 92 155 132 136 154 137

1990 134 136 195 112 126 204 184 163 157 174

2000 174 227 202 167 181 203 229 165 188 194

2010 226 179 351 216 165 150

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1221B 1915 to 2015 101 years Series 29

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

Lower 1923> -.039 1935< -.021 1915< -.017 1918> -.011 1927< -.009 1989> -.008 Higher 1948 .060 1981 .022

1221B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1915 319 352 277 327 366

1920 354 426 310 330 263 257 132 152 196 229

1930 211 212 219 224 120 80 142 179 194 146

1940 113 166 129 84 92 127 115 128 22 105

1950 133 209 181 153 205 211 200 268 247 188

1960 232 283 234 182 170 212 183 198 198 170

1970 192 207 139 171 139 131 122 167 187 174

1980 153 92 122 155 101 129 171 177 141 151

1990 135 154 161 127 121 168 153 106 117 120

2000 99 128 129 96 148 164 179 145 133 173

2010 263 170 293 216 173 125

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1222A 1913 to 2015 103 years Series 30

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

Lower 1970> -.010 1920< -.010 2009> -.009 1985< -.009 1922< -.007 1965< -.006 Higher 1981 .036 1948 .033

1222A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1913 403 369 419 335 257 239 266

1920 175 200 166 123 157 138 120 209 197 159

1930 173 162 185 160 113 165 165 169 125 126

1940 145 159 144 117 96 112 128 139 44 118

1950 73 146 114 72 140 177 138 181 167 169

1960 119 161 125 109 71 102 108 172 142 123

1970 158 154 116 190 102 83 95 107 93 99

1980 95 45 59 83 57 76 91 100 99 82

1990 89 91 105 65 52 104 84 72 78 95

2000 83 126 122 63 73 99 114 97 133 174

2010 185 94 181 147 129 94

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

1222B 1915 to 2015 101 years Series 31

[B] Entire series, effect on correlation ( .715) is:

Lower 1920< -.020 1944> -.015 1981> -.014 1995< -.010 1917> -.009 1989> -.008 Higher 1948 .045 1923 .015

1222B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1915 593 649 568 413 468

1920 281 481 380 211 278 299 238 277 252 235

1930 233 165 180 195 125 156 167 177 154 164

1940 147 170 163 214 188 159 145 159 40 112

1950 113 178 197 125 183 189 181 237 220 203

1960 190 258 215 150 119 158 185 237 162 147

1970 164 160 127 182 122 120 98 151 173 132

1980 149 89 115 156 96 160 155 157 109 149

1990 188 185 157 79 74 99 103 88 98 128

2000 156 172 121 61 89 134 150 131 131 132

2010 162 124 185 133 118 92

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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 1205B 1947 2015 69 3 0 .543 2.64 7.67 1.445 .880 .174 2.56 .423 -.049 1

2 1208A 1935 2015 81 3 0 .502 1.93 7.01 1.975 .891 .424 2.52 .439 -.089 1

3 1208B 1919 2015 97 4 0 .592 3.26 8.17 2.095 .876 .263 2.75 .549 .052 1

4 1209A 1912 2015 104 4 0 .606 2.05 7.59 1.933 .973 .198 2.51 .432 -.012 1

5 1209B 1906 2015 110 4 0 .517 1.78 8.52 1.690 .899 .291 2.76 .502 .023 1

6 1210A 1906 2015 110 4 0 .540 1.77 6.26 1.149 .889 .261 2.43 .304 -.038 1

7 1210B 1913 2015 103 4 0 .600 1.41 3.70 .850 .862 .300 2.53 .324 -.022 1

8 1211A 1905 2015 111 4 0 .547 2.09 6.44 1.186 .777 .317 2.76 .436 .012 1

9 1211B 1906 2015 110 4 0 .574 1.90 5.73 1.026 .691 .316 2.64 .397 -.011 1

10 1212A 1914 2015 102 4 0 .635 2.46 5.07 .969 .858 .160 2.55 .330 -.011 2

11 1212B 1916 2015 100 4 0 .684 1.69 4.02 .786 .873 .187 2.46 .306 -.021 2

12 1213A 1913 2015 103 4 0 .732 1.68 4.96 1.089 .921 .209 2.47 .351 -.074 1

13 1213B 1918 2015 98 4 0 .559 1.48 3.87 .809 .856 .210 2.65 .374 -.040 1

14 1214A 1922 2015 94 4 0 .773 1.89 4.16 1.011 .901 .184 2.53 .383 -.062 1

15 1214B 1905 2015 111 4 0 .655 1.79 4.26 1.011 .922 .171 2.70 .379 -.021 2

16 1215A 1924 2015 92 4 0 .706 1.94 4.22 .831 .833 .234 2.82 .522 -.020 1

17 1215B 1906 2015 110 4 0 .610 1.14 3.02 .508 .704 .287 2.68 .509 .085 1

18 1216A 1904 2015 112 4 0 .492 2.06 5.07 1.083 .836 .232 2.64 .501 -.012 1

19 1216B 1943 2015 73 3 0 .593 1.84 5.70 1.153 .779 .294 2.58 .425 .024 1

20 1217A 1939 2015 77 3 0 .696 1.68 3.66 .541 .603 .212 2.62 .372 -.044 1

21 1217B 1957 2015 59 2 0 .622 2.26 3.73 .544 .587 .164 2.67 .525 .050 1

22 1218A 1957 2015 59 2 1 .436 1.87 3.78 .711 .808 .189 2.46 .474 -.018 1

23 1218B 1947 2015 69 3 0 .501 2.51 4.17 .707 .719 .165 2.65 .491 -.003 1

24 1219A 1947 2015 69 3 0 .595 2.28 6.28 1.503 .943 .162 2.67 .477 -.009 1

25 1219B 1946 2015 70 3 0 .648 2.62 8.52 2.073 .952 .168 2.71 .522 .048 1

26 1220A 1903 2015 113 4 0 .549 1.16 3.45 .740 .913 .221 2.36 .273 -.089 1

27 1220B 1907 2015 109 4 1 .453 1.23 3.16 .579 .824 .224 2.40 .306 -.063 1

28 1221A 1930 2015 86 3 0 .501 1.50 3.51 .494 .600 .231 2.64 .440 -.028 3

29 1221B 1915 2015 101 4 0 .647 1.80 4.26 .701 .777 .228 2.40 .332 .020 1

30 1222A 1913 2015 103 4 0 .786 1.36 4.19 .668 .818 .248 2.57 .382 -.006 1

31 1222B 1915 2015 101 4 0 .715 1.83 6.49 1.043 .854 .232 2.43 .348 .004 1

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Total or mean: 2906 112 2 .602 1.86 8.52 1.056 .831 .234 2.82 .408 -.015

- = [ COFECHA 812 COF ] = -