[] Dendrochronology Program Library Run C01K0 Program COF 11:40 Wed 19 Jul 2017 Page 1

[] P R O G R A M C O F E C H A Version 6.06P 30152

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: C01K07\_TSCA\_corr1

File of DATED series: HHSC01K07\_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 1835 to 2015 181 years

Continuous time span is 1835 to 2015 181 years

Portion with two or more series is 1875 to 2015 141 years

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

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

\*O\* Master series 1835 2015 181 yrs \*O\*

\*F\* Total rings in all series 2328 \*F\*

\*E\* Total dated rings checked 2288 \*E\*

\*C\* Series intercorrelation .607 \*C\*

\*H\* Average mean sensitivity .238 \*H\*

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

\*\*\* Mean length of series 77.6 \*\*\*

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

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

No ring measurements of zero value

PART 2: TIME PLOT OF TREE-RING SERIES: C01K07\_TSCA\_corr1 11:40 Wed 19 Jul 2017 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

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

. . . . . . . . . . . . . . . . . . <========> . 235A 1 1923 2015 93

. . . . . . . . . . . . . . . . . .<=========> . 235B 2 1918 2015 98

. . . . . . . . . . . . . . . . . <===========> . 236A 3 1890 2015 126

. . . . . . . . . . . . . . . . . <===========> . 236B 4 1894 2015 122

. . . . . . . . . . . . . . . . . . .<====> . 346A 5 1969 2015 47

. . . . . . . . . . . . . . . . . . . <===> . 346B 6 1976 2015 40

. . . . . . . . . . . . . . . . . . .<====> . 348A 7 1964 2015 52

. . . . . . . . . . . . . . . . . . . <===> . 348B 8 1970 2015 46

. . . . . . . . . . . . . . . . . .<=========> . 357A 9 1910 2015 106

. . . . . . . . . . . . . . . . . . <=======> . 357B 10 1936 2015 80

. . . . . . . . . . . . . . . . . . .<====> . 358A 11 1963 2015 53

. . . . . . . . . . . . . . . . . . <======> . 358B 12 1948 2015 68

. . . . . . . . . . . . . . . . . . .<====> . 359A 13 1967 2015 49

. . . . . . . . . . . . . . . . . . <=====> . 359B 14 1955 2015 61

. . . . . . . . . . . . . . . . . . . <===> . 405A 15 1978 2015 38

. . . . . . . . . . . . . . . . . . .<====> . 405B 16 1965 2015 51

. . . . . . . . . . . . . . . . . . <========> . 406A 17 1929 2015 87

. . . . . . . . . . . . . . . . . . <========> . 406B 18 1925 2015 91

. . . . . . . . . . . . . . . . . <==========> . 414A 19 1907 2015 109

. . . . . . . . . . . . . . . . . .<=========> . 414B 20 1912 2015 104

. . . . . . . . . . . . . . . . <=================> . 415A 21 1835 2015 181

. . . . . . . . . . . . . . . . . <=============> . 415B 22 1875 2015 141

. . . . . . . . . . . . . . . . . . .<====> . 448A 23 1964 2015 52

. . . . . . . . . . . . . . . . . . .<====> . 448B 24 1964 2015 52

. . . . . . . . . . . . . . . . . .<=========> . 486A 25 1918 2015 98

. . . . . . . . . . . . . . . . . . <=======> . 486B 26 1931 2015 85

. . . . . . . . . . . . . . . . . . <=====> . 487A 27 1959 2015 57

. . . . . . . . . . . . . . . . . . <=====> . 487B 28 1954 2015 62

. . . . . . . . . . . . . . . . . . . <===> . 489A 29 1976 2015 40

. . . . . . . . . . . . . . . . . . . <===> . 489B 30 1977 2015 39

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

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: C01K07\_TSCA\_corr1 11:40 Wed 19 Jul 2017 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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1850 -.643 1 1900 -2.234 4 1950 -1.279 15 2000 .022 30

1851 -.315 1 1901 -3.424 4 1951 .969 15 2001 .326 30

1852 .216 1 1902 .025 4 1952 1.017 15 2002 .414 30

1853 -.064 1 1903 1.777 4 1953 .653 15 2003 -.783 30

1854 -1.241 1 1904 .855 4 1954 .885 16 2004 .334 30

1855 .328 1 1905 .981 4 1955 .766 17 2005 .672 30

1856 -.340 1 1906 1.500 4 1956 -.982 17 2006 -1.678 30

1857 -1.009 1 1907 .894 5 1957 .122 17 2007 .320 30

1858 -.360 1 1908 .263 5 1958 .042 17 2008 .532 30

1859 -.588 1 1909 .327 5 1959 .352 18 2009 .997 30

1860 2.076 1 1910 1.424 6 1960 -2.255 18 2010 1.152 30

1861 2.338 1 1911 -.887 6 1961 .325 18 2011 -.473 30

1862 2.166 1 1912 .441 7 1962 -.461 18 2012 1.029 30

1863 .922 1 1913 .722 7 1963 .759 19 2013 .342 30

1864 .861 1 1914 -.175 7 1964 -.504 22 2014 .584 30

1865 .779 1 1915 -.065 7 1965 -.101 23 2015 -3.252 30

1866 .597 1 1916 .301 7 1966 1.132 23

1867 .222 1 1917 -.473 7 1967 .697 24

1868 -.834 1 1918 -.544 9 1968 .099 24

1869 -1.538 1 1919 .053 9 1969 .791 25

1870 -1.885 1 1920 .454 9 1970 -.515 26

1871 .320 1 1921 -.739 9 1971 .191 26

1872 -1.042 1 1922 .068 9 1972 -.269 26

1873 -1.204 1 1923 -1.446 10 1973 1.115 26

1874 -1.281 1 1924 -.478 10 1974 .068 26

1875 -.297 2 1925 -.213 11 1975 -1.051 26

1876 -1.282 2 1926 .410 11 1976 -.771 28

1877 -.786 2 1927 .639 11 1977 -.800 29

1878 .450 2 1928 .404 11 1978 .320 30

1879 -1.737 2 1929 .668 12 1979 -.218 30

1880 .293 2 1930 .735 12 1980 -.264 30

1881 1.634 2 1931 .170 13 1981 .424 30

1882 1.512 2 1932 .823 13 1982 .528 30

1883 1.004 2 1933 .542 13 1983 1.237 30

1884 1.484 2 1934 -2.195 13 1984 -.684 30

1835 .441 1 1885 -.499 2 1935 -.251 13 1985 -.099 30

1836 .064 1 1886 1.877 2 1936 -.367 14 1986 .049 30

1837 .000 1 1887 .234 2 1937 -.911 14 1987 .696 30

1838 1.393 1 1888 1.297 2 1938 -.590 14 1988 .091 30

1839 2.532 1 1889 .259 2 1939 -.492 14 1989 -.503 30

1840 .607 1 1890 .907 3 1940 -.291 14 1990 -2.224 30

1841 -.467 1 1891 .097 3 1941 -.048 14 1991 -.223 30

1842 2.178 1 1892 .048 3 1942 -.846 14 1992 .106 30

1843 -.522 1 1893 -.774 3 1943 .653 14 1993 -.016 30

1844 -1.960 1 1894 -.206 4 1944 .006 14 1994 -1.497 30

1845 -1.763 1 1895 -.865 4 1945 .468 14 1995 -.345 30

1846 -.525 1 1896 -.757 4 1946 1.701 14 1996 -.398 30

1847 -1.309 1 1897 .109 4 1947 .755 14 1997 .093 30

1848 -1.213 1 1898 -.131 4 1948 -1.393 15 1998 .270 30

1849 -.005 1 1899 -1.554 4 1949 -.578 15 1999 1.455 30

PART 4: Master Bar Plot: C01K07\_TSCA\_corr1 11:40 Wed 19 Jul 2017 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

1850--c 1900i 1950-e 2000-----@

1851---a 1901n 1951---------D 2001------A

1852------A 1902-----@ 1952---------D 2002-------B

1853----@ 1903----------G 1953--------C 2003--c

1854-e 1904---------C 1954---------D 2004------A

1855------A 1905---------D 1955--------C 2005--------C

1856---a 1906----------F 1956-d 2006g

1857-d 1907---------D 1957-----@ 2007------A

1858---a 1908------A 1958-----@ 2008-------B

1859--b 1909------A 1959------A 2009---------D

1860----------H 1910----------F 1960i 2010---------E

1861----------I 1911-d 1961------A 2011---b

1862----------I 1912-------B 1962---b 2012---------D

1863---------D 1913--------C 1963--------C 2013------A

1864---------C 1914----a 1964--b 2014--------B

1865--------C 1915----@ 1965----@ 2015m

1866--------B 1916------A 1966---------E

1867------A 1917---b 1967--------C

1868-c 1918--b 1968-----@

1869f 1919-----@ 1969--------C

1870h 1920-------B 1970--b

1871------A 1921--c 1971------A

1872-d 1922-----@ 1972---a

1873-e 1923f 1973---------D

1874-e 1924---b 1974-----@

1875---a 1925----a 1975-d

1876-e 1926-------B 1976--c

1877--c 1927--------C 1977-c

1878-------B 1928-------B 1978------A

1879g 1929--------C 1979----a

1880------A 1930--------C 1980---a

1881----------G 1931-----A 1981-------B

1882----------F 1932--------C 1982-------B

1883---------D 1933-------B 1983---------E

1884----------F 1934i 1984--c

1835-------B 1885--b 1935---a 1985----@

1836-----@ 1886----------H 1936---a 1986-----@

1837-----@ 1887------A 1937-d 1987--------C

1838----------F 1888---------E 1938--b 1988-----@

1839----------J 1889------A 1939--b 1989--b

1840--------B 1890---------D 1940---a 1990i

1841---b 1891-----@ 1941----@ 1991----a

1842----------I 1892-----@ 1942-c 1992-----@

1843--b 1893--c 1943--------C 1993-----@

1844h 1894----a 1944-----@ 1994f

1845g 1895-c 1945-------B 1995---a

1846--b 1896--c 1946----------G 1996---b

1847-e 1897-----@ 1947--------C 1997-----@

1848-e 1898----a 1948f 1998------A

1849-----@ 1899f 1949--b 1999----------F

PART 5: CORRELATION OF SERIES BY SEGMENTS: C01K07\_TSCA\_corr1 11:40 Wed 19 Jul 2017 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 235A 1923 2015 .28A .38 .63 .64

2 235B 1918 2015 .32A .40 .57 .80

3 236A 1890 2015 .68 .69 .77 .65 .66

4 236B 1894 2015 .67 .74 .69 .69 .74

5 346A 1969 2015 .54

6 346B 1976 2015 .60

7 348A 1964 2015 .64 .74

8 348B 1970 2015 .61

9 357A 1910 2015 .40 .59 .62 .54

10 357B 1936 2015 .45 .53 .63

11 358A 1963 2015 .57 .68

12 358B 1948 2015 .56 .56 .65

13 359A 1967 2015 .57

14 359B 1955 2015 .19B .10B

15 405A 1978 2015 .78

16 405B 1965 2015 .53 .71

17 406A 1929 2015 .73 .47 .54

18 406B 1925 2015 .64 .63 .68

19 414A 1907 2015 .57 .69 .73 .76

20 414B 1912 2015 .51 .69 .64 .71

21 415A 1835 2015 .41 .57 .61 .73 .67

22 415B 1875 2015 .42 .61 .71 .74 .72

23 448A 1964 2015 .47 .51

24 448B 1964 2015 .62 .74

25 486A 1918 2015 .41 .43 .59 .78

26 486B 1931 2015 .67 .68 .79

27 487A 1959 2015 .46 .73

28 487B 1954 2015 .52 .74

29 489A 1976 2015 .54

30 489B 1977 2015 .58

Av segment correlation .54 .51 .60 .58 .66

PART 6: POTENTIAL PROBLEMS: C01K07\_TSCA\_corr1 11:40 Wed 19 Jul 2017 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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235A 1923 to 2015 93 years Series 1

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

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

1923 1972 0 -.07 -.47 .06 .00 .12 -.10 -.01 .13 .19 -.14 .28\* .04 -.02 .02 .26 .04 -.09 -.14 -.12 -.16 -.05

[B] Entire series, effect on correlation ( .465) is:

Lower 1923> -.051 1934> -.045 1948> -.016 2003> -.013 1942> -.009 1975> -.009 Higher 1990 .041 2015 .033

1923 to 1972 segment:

Lower 1923> -.096 1934> -.073 1948> -.024 1942> -.016 1954< -.015 1955< -.015 Higher 1956 .072 1960 .059

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

1923 +5.1 SD; 1934 +3.7 SD; 1969 +3.2 SD

235A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1923 473 330 351 387 339 387 301

1930 286 298 402 300 318 320 223 183 214 222

1940 311 265 342 322 280 275 466 400 355 415

1950 356 509 442 386 280 254 188 331 275 296

1960 224 283 215 280 266 322 353 248 255 378

1970 251 284 233 238 223 232 212 182 254 208

1980 238 185 185 203 151 166 174 211 209 181

1990 141 194 195 227 190 173 155 211 221 282

2000 203 206 221 234 186 236 104 142 132 176

2010 209 132 206 207 175 45

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

235B 1918 to 2015 98 years Series 2

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

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

1918 1967 0 -.07 -.34 -.12 .15 .11 -.21 -.03 .04 .27 -.30 .32\*-.13 .00 .08 .00 .13 -.10 -.25 .19 -.03 .02

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

Lower 1923> -.028 1942> -.027 1934> -.024 1962< -.023 1955< -.012 1918< -.011 Higher 2015 .107 2006 .020

1918 to 1967 segment:

Lower 1942> -.047 1923> -.044 1962< -.024 1955< -.023 1934> -.021 1929< -.017 Higher 1960 .069 1948 .036

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

1922 +3.2 SD; 1923 +3.6 SD; 1942 +4.4 SD; 1965 +3.2 SD

235B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1918 242 428

1920 420 396 490 416 358 321 323 372 332 304

1930 323 305 338 357 305 347 269 253 255 277

1940 276 256 357 357 289 240 296 242 217 281

1950 249 290 271 307 306 229 206 281 255 305

1960 208 301 179 262 278 353 353 270 218 279

1970 227 291 252 240 214 230 228 246 293 199

1980 202 255 250 255 196 204 188 192 202 149

1990 129 145 138 129 117 130 143 169 168 228

2000 167 177 183 153 162 190 111 139 129 159

2010 161 130 161 124 122 36

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236A 1890 to 2015 126 years Series 3

[B] Entire series, effect on correlation ( .702) is:

Lower 1972< -.023 1906< -.013 1924> -.011 1996< -.010 1993< -.009 1928< -.009 Higher 2015 .032 1934 .023

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

1924 +3.1 SD

236A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1890 253 194 231 144 159 116 122 182 223 122

1900 83 112 339 603 464 407 328 365 363 376

1910 460 291 416 335 328 338 314 266 229 268

1920 254 243 224 178 254 195 185 213 144 171

1930 183 151 136 121 50 60 80 56 70 54

1940 67 62 61 63 82 106 130 107 59 70

1950 58 102 93 80 93 77 59 72 79 77

1960 47 80 56 87 81 81 107 91 70 99

1970 78 100 56 72 76 80 71 82 123 121

1980 122 117 151 157 84 108 131 142 124 119

1990 91 122 110 82 90 122 91 111 157 186

2000 228 237 242 245 330 285 191 258 268 331

2010 305 218 378 313 305 88

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

236B 1894 to 2015 122 years Series 4

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

Lower 1961< -.013 1956> -.012 1902< -.012 1916< -.010 1894> -.009 1968< -.008 Higher 1960 .017 1934 .012

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

1894 +3.1 SD

236B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1894 131 111 73 100 88 60

1900 35 8 64 281 159 214 328 256 213 219

1910 380 143 178 258 194 204 138 136 150 157

1920 156 125 142 83 159 147 172 162 112 158

1930 172 112 110 124 73 82 89 64 80 92

1940 66 72 64 72 70 75 102 87 58 81

1950 76 123 102 118 108 108 91 94 111 100

1960 37 54 59 94 86 107 137 110 71 123

1970 101 138 104 123 146 108 88 102 108 95

1980 79 93 139 163 84 90 104 135 105 96

1990 77 160 136 115 98 118 97 106 129 214

2000 154 160 190 159 217 256 131 179 219 267

2010 302 200 326 183 190 57

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346A 1969 to 2015 47 years Series 5

[B] Entire series, effect on correlation ( .538) is:

Lower 1969< -.126 1984> -.039 1976> -.016 1990> -.015 2012< -.013 1986< -.009 Higher 2015 .353 1975 .018

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

1969 -5.6 SD

346A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1969 172

1970 238 249 244 259 283 167 284 201 223 194

1980 183 244 248 202 256 190 116 123 87 47

1990 52 54 59 52 66 56 255 321 507 570

2000 408 413 443 375 362 330 225 289 344 352

2010 300 240 221 185 241 65

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

346B 1976 to 2015 40 years Series 6

[B] Entire series, effect on correlation ( .596) is:

Lower 1984> -.033 2012< -.029 2011> -.028 2006> -.021 2003> -.019 2010< -.018 Higher 2015 .470 2008 .004

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

2015 -4.8 SD

346B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1976 256 145 134 167

1980 185 434 321 336 343 287 240 260 207 150

1990 82 67 60 61 61 67 331 516 690 675

2000 591 545 448 514 479 412 353 369 452 406

2010 327 413 311 402 306 85

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348A 1964 to 2015 52 years Series 7

[B] Entire series, effect on correlation ( .733) is:

Lower 1984> -.025 1970> -.017 1966< -.014 1975< -.012 2008< -.009 1995< -.009 Higher 2015 .088 1990 .032

348A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1964 265 263 330 428 459 489

1970 519 486 454 605 478 306 418 413 467 393

1980 333 493 383 401 364 341 391 314 240 181

1990 127 179 204 235 174 152 153 188 292 235

2000 215 245 238 206 253 208 127 216 185 292

2010 301 233 301 219 289 79

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348B 1970 to 2015 46 years Series 8

[B] Entire series, effect on correlation ( .613) is:

Lower 1990> -.047 1984> -.040 1980< -.027 2006> -.023 1975< -.011 2011> -.011 Higher 2015 .212 1994 .013

348B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1970 433 414 420 446 370 221 334 323 382 258

1980 181 346 319 363 347 282 245 246 228 180

1990 230 275 273 211 180 201 231 238 335 313

2000 301 286 345 238 257 265 249 281 257 346

2010 317 283 279 238 250 80

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357A 1910 to 2015 106 years Series 9

[B] Entire series, effect on correlation ( .500) is:

Lower 1948> -.029 1981< -.022 1943< -.020 1910< -.013 1914> -.010 1919< -.009 Higher 1934 .047 1960 .031

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

1914 +3.0 SD; 1948 +3.9 SD

357A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1910 420 398 599 783 774 413 379 239 583 324

1920 491 391 538 443 516 477 478 636 468 441

1930 589 591 625 521 275 412 473 477 475 495

1940 466 361 238 246 303 411 515 459 448 371

1950 279 370 336 269 282 257 151 266 174 220

1960 111 189 148 165 112 117 142 121 170 170

1970 141 175 126 191 122 120 108 124 111 115

1980 119 87 101 106 74 113 115 106 109 105

1990 80 84 98 87 74 114 89 105 101 128

2000 91 80 86 95 103 116 63 109 107 94

2010 130 67 113 58 73 25

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

357B 1936 to 2015 80 years Series 10

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

Lower 1981< -.021 1948> -.019 1937> -.017 1951< -.014 1984< -.012 1995> -.012 Higher 2006 .029 2015 .026

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

1969 +3.6 SD; 1984 -5.0 SD; 1995 +4.5 SD

357B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1936 465 485 415 419

1940 416 481 337 420 389 414 384 278 294 253

1950 176 229 266 248 272 268 166 196 152 181

1960 126 233 259 299 243 261 278 215 248 450

1970 208 145 117 157 115 113 91 98 125 114

1980 138 74 96 100 49 80 74 83 89 88

1990 67 87 113 106 81 150 94 109 103 145

2000 95 107 95 83 91 112 64 93 106 97

2010 108 76 121 88 108 41

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

358A 1963 to 2015 53 years Series 11

[B] Entire series, effect on correlation ( .678) is:

Lower 2006> -.035 1994> -.034 2002< -.023 1966< -.020 1996< -.016 1977> -.013 Higher 2015 .106 1990 .042

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

1994 +3.5 SD

358A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1963 409 284 304 335 454 516 554

1970 515 548 499 587 406 360 329 416 421 310

1980 363 390 315 360 243 268 272 303 247 194

1990 151 198 249 298 268 278 189 228 233 259

2000 196 222 175 148 247 252 222 271 282 276

2010 255 181 308 202 249 62

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358B 1948 to 2015 68 years Series 12

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

Lower 2000< -.042 1960> -.017 1983< -.016 1986< -.008 1959< -.008 1950> -.008 Higher 2015 .038 1990 .027

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

1973 +3.8 SD; 1990 -5.1 SD

358B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1948 72 119

1950 161 267 269 284 322 290 214 189 158 151

1960 172 415 344 344 269 232 309 303 349 332

1970 322 380 425 684 453 337 298 291 311 250

1980 236 218 240 200 183 171 149 158 146 124

1990 91 126 144 143 115 142 121 133 133 182

2000 109 156 133 113 143 149 118 178 234 236

2010 235 141 283 194 248 55

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359A 1967 to 2015 49 years Series 13

[B] Entire series, effect on correlation ( .575) is:

Lower 1971< -.041 2006> -.038 1976> -.026 2003< -.023 1977> -.015 2000> -.013 Higher 1990 .058 2015 .052

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

1976 +3.8 SD; 1977 +3.2 SD; 1995 +3.1 SD

359A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1967 559 557 508

1970 466 318 359 458 341 266 521 449 424 375

1980 243 257 210 229 135 142 175 168 151 120

1990 71 119 167 130 104 203 185 147 124 173

2000 176 149 140 67 146 153 130 190 129 146

2010 153 59 94 88 118 37

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

359B 1955 to 2015 61 years Series 14

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

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

1955 2004 8 -.21 .09 .21 .04 -.10 -.12 -.06 .12 -.11 -.05 .19|-.16 -.07 .03 .26 -.30 .06 -.06 .26\*-.09 -.08

1966 2015 -7 -.20 .02 -.03 .35\*-.43 .15 -.19 .16 -.08 -.15 .10| - - - - - - - - - -

[B] Entire series, effect on correlation ( .155) is:

Lower 1967< -.042 1960> -.035 2015> -.014 1955> -.014 1973< -.005 1990> -.004 Higher 1956 .092 1966 .042

1955 to 2004 segment:

Lower 1960> -.062 1967< -.055 1955> -.016 1990> -.011 1973< -.009 1969< -.006 Higher 1956 .134 1966 .057

1966 to 2015 segment:

Lower 1967< -.120 1990> -.005 1973< -.005 1994> -.005 2006> -.004 2015> -.004 Higher 1966 .114 1975 .004

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

1966 1967 -4.9 SD

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

1955 +6.6 SD; 1956 +5.5 SD; 1957 +3.6 SD; 1958 +3.3 SD; 1960 +5.5 SD; 1966 +3.9 SD

359B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1955 58 53 18 12 8

1960 12 39 47 98 196 241 453 265 334 283

1970 304 279 273 295 233 198 255 157 297 266

1980 240 248 246 268 248 260 234 200 155 130

1990 118 142 140 158 155 152 146 119 120 167

2000 146 110 85 71 105 106 100 192 172 175

2010 187 117 198 150 166 51

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

405A 1978 to 2015 38 years Series 15

[B] Entire series, effect on correlation ( .784) is:

Lower 1978< -.045 2003< -.023 2002< -.010 1998> -.006 2000> -.005 1986< -.004 Higher 2015 .117 1990 .010

405A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1978 146 273

1980 312 499 411 373 249 262 225 261 266 197

1990 158 217 313 295 186 233 243 313 349 313

2000 284 291 241 170 248 296 209 256 256 265

2010 323 243 325 246 211 67

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

405B 1965 to 2015 51 years Series 16

[B] Entire series, effect on correlation ( .702) is:

Lower 1967< -.035 1979> -.017 1984> -.014 1965> -.011 1993< -.009 2010< -.009 Higher 2015 .174 2006 .017

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

1981 +3.2 SD

405B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1965 355 320 146 162 159

1970 146 143 161 191 166 133 105 175 213 330

1980 363 464 323 295 252 211 173 212 181 211

1990 160 262 251 187 160 185 212 250 314 377

2000 341 328 265 173 241 251 173 229 216 278

2010 225 129 205 249 231 62

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406A 1929 to 2015 87 years Series 17

[B] Entire series, effect on correlation ( .607) is:

Lower 1998< -.087 1990> -.041 1981< -.009 1948> -.009 1932< -.008 1953< -.006 Higher 2006 .026 1960 .026

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

1990 +4.5 SD; 1998 -4.8 SD

406A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1929 762

1930 569 417 377 338 225 421 365 322 273 367

1940 352 352 240 504 353 521 503 518 376 319

1950 271 368 334 305 379 449 277 394 359 407

1960 237 396 330 407 260 250 330 310 278 276

1970 198 193 193 251 151 136 128 135 148 129

1980 119 117 155 160 131 192 225 239 204 198

1990 200 216 184 168 131 167 178 165 114 165

2000 120 159 159 125 130 149 87 137 146 146

2010 159 103 190 140 190 44

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406B 1925 to 2015 91 years Series 18

[B] Entire series, effect on correlation ( .643) is:

Lower 1931< -.038 1990> -.020 1942> -.013 1998< -.011 1993> -.009 1981< -.007 Higher 1934 .038 2015 .027

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

1993 +3.5 SD

406B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1925 195 215 203 240 225

1930 228 155 188 202 142 231 246 239 250 247

1940 222 294 322 401 281 340 360 352 287 242

1950 203 299 347 355 440 462 295 399 373 402

1960 239 383 274 295 240 262 381 371 340 406

1970 286 329 274 354 212 156 173 150 167 135

1980 116 120 131 162 112 111 127 197 181 166

1990 170 221 251 300 186 236 217 246 161 233

2000 145 198 246 196 163 200 108 167 208 170

2010 177 96 159 160 159 35

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414A 1907 to 2015 109 years Series 19

[B] Entire series, effect on correlation ( .683) is:

Lower 1918> -.014 1948< -.013 2005< -.009 1956> -.009 1913< -.006 1995> -.006 Higher 1960 .028 1990 .018

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

1918 +3.0 SD; 1995 +3.2 SD

414A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1907 667 461 430

1910 563 386 436 414 352 399 444 410 427 410

1920 403 280 272 269 314 287 265 249 244 231

1930 205 209 211 182 134 162 155 102 101 95

1940 99 109 80 76 70 71 105 104 21 48

1950 57 86 103 57 49 70 60 52 61 71

1960 30 52 77 92 82 83 159 142 76 87

1970 70 89 83 102 95 85 79 100 122 117

1980 120 169 196 228 150 125 141 213 169 161

1990 111 156 151 175 159 222 192 187 155 207

2000 173 145 162 133 184 156 117 233 259 262

2010 258 155 249 196 212 56

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414B 1912 to 2015 104 years Series 20

[B] Entire series, effect on correlation ( .596) is:

Lower 1921< -.069 1993> -.015 1917> -.014 1994> -.013 1935> -.010 2000< -.008 Higher 2015 .023 1960 .023

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

1917 +3.5 SD; 1921 -4.9 SD; 1935 +4.0 SD; 1993 +4.2 SD; 1994 +3.8 SD

414B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1912 522 477 385 390 523 527 458 405

1920 422 218 301 238 280 292 258 270 283 273

1930 256 213 251 224 168 248 187 165 134 150

1940 157 116 100 114 104 117 157 127 78 81

1950 72 111 112 106 83 75 46 65 69 101

1960 40 80 124 199 201 219 219 237 182 237

1970 158 196 167 220 184 126 97 130 181 164

1980 156 190 210 257 155 195 214 242 177 213

1990 160 200 198 348 266 271 233 240 200 226

2000 149 204 217 167 236 268 160 213 282 399

2010 395 245 370 302 321 77

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415A 1835 to 2015 181 years Series 21

[\*] Early part of series cannot be checked from 1835 to 1874 -- not matched by another series

[B] Entire series, effect on correlation ( .528) is:

Lower 1879> -.097 1945< -.018 1989> -.010 1937> -.010 1884< -.005 1912< -.005 Higher 1960 .015 1934 .013

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

1879 +6.1 SD; 1948 -7.0 SD; 1989 +3.6 SD

415A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1835 32 28 29 56 92

1840 43 25 92 27 8 12 35 25 30 62

1850 53 68 92 91 63 123 104 84 115 110

1860 299 334 317 206 197 185 167 140 93 69

1870 59 115 71 65 61 66 47 50 92 97

1880 98 120 128 96 97 71 161 106 134 110

1890 108 77 82 89 73 61 88 132 124 86

1900 69 36 257 345 277 276 493 264 244 253

1910 366 189 173 251 144 133 202 153 146 175

1920 181 142 139 132 106 119 232 226 238 211

1930 184 164 170 206 88 100 94 159 130 96

1940 139 137 88 139 90 49 92 78 26 71

1950 49 90 107 88 80 90 68 73 80 84

1960 54 80 71 88 79 99 101 104 73 82

1970 49 69 54 104 70 73 71 66 82 66

1980 72 79 77 99 62 78 87 95 102 141

1990 76 121 124 129 92 134 161 186 160 325

2000 193 201 186 191 201 240 145 348 438 437

2010 541 264 393 248 281 72

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415B 1875 to 2015 141 years Series 22

[B] Entire series, effect on correlation ( .602) is:

Lower 1879< -.071 1924< -.024 1921> -.016 1935< -.015 1937> -.005 1959> -.005 Higher 1960 .025 1990 .019

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

1879 -6.1 SD; 1924 -6.6 SD; 1925 -4.6 SD

415B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1875 100 90 108 120 47

1880 113 196 181 192 258 124 207 134 198 145

1890 177 178 158 129 153 149 198 289 274 178

1900 177 96 379 521 540 639 684 583 618 665

1910 743 511 684 660 632 669 575 504 514 437

1920 415 462 360 272 181 182 239 202 178 218

1930 196 163 168 159 72 49 73 100 94 92

1940 88 104 66 164 144 181 275 168 65 81

1950 62 118 110 108 99 98 69 73 82 158

1960 64 116 100 127 89 100 98 127 117 135

1970 80 110 85 125 106 106 87 93 95 95

1980 93 154 173 218 111 143 143 160 159 182

1990 95 138 121 142 125 186 168 199 139 219

2000 156 186 228 175 185 381 127 248 289 313

2010 343 132 254 160 179 42

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448A 1964 to 2015 52 years Series 23

[B] Entire series, effect on correlation ( .506) is:

Lower 1977< -.121 1995< -.034 1973< -.014 1981< -.014 1998< -.009 1999< -.008 Higher 2006 .042 2015 .033

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

1977 -5.8 SD

448A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1964 369 372 409 398 378 381

1970 290 311 299 278 294 212 255 153 293 304

1980 292 237 289 318 262 311 318 315 308 270

1990 227 281 273 253 225 194 230 218 205 219

2000 228 248 242 200 238 219 147 214 196 200

2010 262 185 287 264 255 48

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448B 1964 to 2015 52 years Series 24

[B] Entire series, effect on correlation ( .737) is:

Lower 1990> -.026 1984> -.025 1981< -.013 1995< -.011 2000> -.011 1998> -.010 Higher 2015 .113 2006 .028

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

1998 +3.2 SD

448B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1964 363 416 470 553 394 373

1970 313 323 347 394 421 269 298 218 399 339

1980 269 216 335 465 405 321 325 336 302 267

1990 220 225 254 220 149 159 244 285 439 356

2000 320 271 273 236 260 233 143 237 234 264

2010 271 197 237 222 196 49

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486A 1918 to 2015 98 years Series 25

[B] Entire series, effect on correlation ( .586) is:

Lower 1921> -.025 1975> -.016 1923< -.013 1965< -.012 1925> -.011 1978< -.007 Higher 2015 .075 1990 .018

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

1921 +3.1 SD; 1925 +3.3 SD; 1975 +3.0 SD

486A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1918 126 208

1920 227 347 373 101 217 365 264 204 244 236

1930 197 230 182 151 119 108 141 103 143 90

1940 74 95 72 128 128 144 114 75 54 32

1950 30 84 112 117 162 116 80 94 116 139

1960 90 151 135 160 86 53 94 101 99 100

1970 63 79 137 175 151 152 150 107 94 89

1980 122 131 139 169 99 129 117 198 149 134

1990 60 87 84 58 51 70 87 123 152 223

2000 172 179 167 96 96 124 66 110 135 117

2010 164 104 178 145 162 30

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486B 1931 to 2015 85 years Series 26

[B] Entire series, effect on correlation ( .781) is:

Lower 1950> -.013 1969< -.012 1975> -.009 1931> -.008 1970< -.006 1966< -.006 Higher 2015 .041 1990 .015

486B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1931 370 335 267 145 218 148 122 174 121

1940 130 144 98 166 146 179 212 157 103 107

1950 155 283 274 235 257 158 83 91 100 97

1960 50 80 63 69 35 54 60 56 59 54

1970 35 58 84 173 147 145 129 165 147 168

1980 190 236 188 328 213 243 278 329 224 210

1990 142 201 213 196 136 205 195 240 201 323

2000 192 250 312 194 253 338 176 308 300 286

2010 299 175 270 219 344 58

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487A 1959 to 2015 57 years Series 27

[B] Entire series, effect on correlation ( .650) is:

Lower 1959< -.048 1990> -.047 1960> -.018 1986< -.012 1993> -.012 1978< -.011 Higher 2015 .167 2006 .027

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

1990 +3.0 SD; 1993 +3.3 SD

487A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1959 320

1960 354 456 491 524 503 479 520 567 396 517

1970 452 523 494 667 410 269 305 272 258 303

1980 242 318 258 278 216 193 185 248 245 209

1990 235 260 269 313 218 203 202 189 276 274

2000 245 218 240 212 297 270 163 196 195 220

2010 218 185 206 179 167 35

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487B 1954 to 2015 62 years Series 28

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

Lower 1997< -.030 1955< -.028 1984> -.024 2001< -.017 1956> -.016 1959< -.014 Higher 2015 .090 2006 .022

487B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1954 274 251 246 253 288 240

1960 199 247 217 266 217 191 290 316 280 380

1970 306 253 213 190 203 132 120 117 179 191

1980 174 251 246 249 215 186 173 151 131 114

1990 102 156 157 157 120 125 124 89 112 137

2000 89 72 86 67 105 122 67 128 154 179

2010 147 92 128 150 131 25

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489A 1976 to 2015 40 years Series 29

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

Lower 1982< -.096 1984> -.050 2000> -.026 1980> -.018 2003> -.018 1977> -.014 Higher 2015 .285 1994 .016

489A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1976 332 368 402 322

1980 415 438 240 269 305 224 236 186 134 100

1990 82 106 126 94 60 92 187 140 182 227

2000 394 388 435 408 409 322 238 325 315 370

2010 369 201 341 313 225 49

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489B 1977 to 2015 39 years Series 30

[B] Entire series, effect on correlation ( .576) is:

Lower 2006> -.079 1984> -.055 2003> -.033 1999< -.029 1998> -.013 1982< -.012 Higher 2015 .357 1990 .019

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

2006 +3.2 SD

489B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1977 412 574 472

1980 386 537 384 473 512 388 399 337 256 205

1990 135 177 217 162 137 147 315 401 695 487

2000 479 379 442 559 564 464 533 530 527 585

2010 522 378 419 355 280 66

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PART 7: DESCRIPTIVE STATISTICS: C01K07\_TSCA\_corr1 11:40 Wed 19 Jul 2017 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 235A 1923 2015 93 4 1 .465 2.57 5.09 .864 .713 .199 2.78 .522 .037 1

2 235B 1918 2015 98 4 1 .567 2.44 4.90 .835 .817 .161 2.58 .421 -.037 1

3 236A 1890 2015 126 5 0 .702 1.69 6.03 1.103 .860 .229 2.63 .474 -.049 1

4 236B 1894 2015 122 5 0 .709 1.31 3.80 .644 .632 .283 2.56 .411 .015 1

5 346A 1969 2015 47 1 0 .538 2.34 5.70 1.239 .828 .243 2.31 .391 -.086 2

6 346B 1976 2015 40 1 0 .596 3.12 6.90 1.735 .838 .253 2.42 .354 .167 1

7 348A 1964 2015 52 2 0 .733 3.03 6.05 1.204 .794 .220 2.59 .565 .054 1

8 348B 1970 2015 46 1 0 .613 2.85 4.46 .739 .577 .178 2.43 .487 .020 1

9 357A 1910 2015 106 4 0 .500 2.58 7.83 1.856 .882 .238 2.63 .430 -.053 3

10 357B 1936 2015 80 3 0 .574 1.86 4.85 1.209 .888 .235 2.80 .440 -.012 1

11 358A 1963 2015 53 2 0 .678 3.04 5.87 1.136 .806 .201 2.50 .571 .041 1

12 358B 1948 2015 68 3 0 .619 2.23 6.84 1.075 .762 .215 2.94 .445 -.051 1

13 359A 1967 2015 49 1 0 .575 2.21 5.59 1.421 .879 .276 2.61 .565 -.026 1

14 359B 1955 2015 61 2 2 .155 1.71 4.53 .915 .802 .257 3.72 .406 -.635 1

15 405A 1978 2015 38 1 0 .784 2.64 4.99 .758 .482 .236 2.55 .548 .042 1

16 405B 1965 2015 51 2 0 .702 2.26 4.64 .791 .648 .236 2.52 .441 .005 1

17 406A 1929 2015 87 3 0 .607 2.57 7.62 1.304 .799 .221 2.50 .480 -.073 2

18 406B 1925 2015 91 3 0 .643 2.37 4.62 .889 .742 .218 2.50 .415 -.057 1

19 414A 1907 2015 109 4 0 .683 1.81 6.67 1.233 .917 .215 2.71 .405 -.082 2

20 414B 1912 2015 104 4 0 .596 2.14 5.27 1.067 .832 .227 2.71 .390 -.041 1

21 415A 1835 2015 181 5 0 .528 1.32 5.41 .923 .772 .299 2.61 .365 -.044 2

22 415B 1875 2015 141 5 0 .602 2.10 7.43 1.642 .905 .272 2.70 .446 -.004 3

23 448A 1964 2015 52 2 0 .506 2.63 4.09 .671 .633 .168 2.29 .414 -.064 1

24 448B 1964 2015 52 2 0 .737 2.95 5.53 .939 .685 .206 2.58 .510 .049 3

25 486A 1918 2015 98 4 0 .586 1.33 3.73 .640 .642 .297 2.52 .407 -.014 1

26 486B 1931 2015 85 3 0 .781 1.81 3.70 .859 .654 .289 2.74 .538 -.049 2

27 487A 1959 2015 57 2 0 .650 3.01 6.67 1.284 .843 .175 2.62 .428 .032 1

28 487B 1954 2015 62 2 0 .692 1.77 3.80 .733 .836 .212 2.64 .539 .010 1

29 489A 1976 2015 40 1 0 .543 2.59 4.38 1.185 .777 .271 2.51 .499 -.020 1

30 489B 1977 2015 39 1 0 .576 3.92 6.95 1.515 .738 .241 2.59 .428 .080 1

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Total or mean: 2328 82 4 .607 2.17 7.83 1.077 .778 .238 3.72 .448 -.034

- = [ COFECHA C01K0COF ] = -