[] Dendrochronology Program Library Run 3 Program COF 13:55 Wed 14 Mar 2012 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 28199

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: FINAL

File of DATED series: CEN002\_PIST

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 N

8 Parts printed 1234567

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

Time span of Master dating series is 1877 to 2011 135 years

Continuous time span is 1877 to 2011 135 years

Portion with two or more series is 1885 to 2011 127 years

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

\*C\* Number of dated series 22 \*C\*

\*O\* Master series 1877 2011 135 yrs \*O\*

\*F\* Total rings in all series 2141 \*F\*

\*E\* Total dated rings checked 2133 \*E\*

\*C\* Series intercorrelation .659 \*C\*

\*H\* Average mean sensitivity .243 \*H\*

\*A\* Segments, possible problems 3 \*A\*

\*\*\* Mean length of series 97.3 \*\*\*

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

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

11A 3 absent rings: 1998 1999 2000

11B 1 absent rings: 1999

4 absent rings .187%

PART 2: TIME PLOT OF TREE-RING SERIES: FINAL 13:55 Wed 14 Mar 2012 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

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

. . . . . . . . . . . . . . . . . . <========> . 2A 1 1927 2011 85

. . . . . . . . . . . . . . . . . <==========> . 2B 2 1906 2011 106

. . . . . . . . . . . . . . . . . . <======> . 07A 3 1946 2011 66

. . . . . . . . . . . . . . . . . . <=======> . 07B 4 1932 2011 80

. . . . . . . . . . . . . . . . . <===========> . 11A 5 1895 2011 117

. . . . . . . . . . . . . . . . . . <========> . 11B 6 1929 2011 83

. . . . . . . . . . . . . . . . . <==========> . 15A 7 1900 2011 112

. . . . . . . . . . . . . . . . . <==========> . 15B 8 1902 2011 110

. . . . . . . . . . . . . . . . . <=============> . 17A 9 1877 2011 135

. . . . . . . . . . . . . . . . . <==========> . 17B 10 1900 2011 112

. . . . . . . . . . . . . . . . . . <========> . 21A 11 1921 2011 91

. . . . . . . . . . . . . . . . . . <=======> . 21B 12 1933 2011 79

. . . . . . . . . . . . . . . . . <==========> . 22A 13 1904 2011 108

. . . . . . . . . . . . . . . . . .<=========> . 22B 14 1917 2011 95

. . . . . . . . . . . . . . . . . <============> . 24A 15 1885 2011 127

. . . . . . . . . . . . . . . . . . <=======> . 24B 16 1935 2011 77

. . . . . . . . . . . . . . . . . <============> . 26A 17 1888 2011 124

. . . . . . . . . . . . . . . . . <==========> . 26B 18 1908 2011 104

. . . . . . . . . . . . . . . . . . <=====> . 27A 19 1951 2011 61

. . . . . . . . . . . . . . . . . . <=======> . 27B 20 1933 2011 79

. . . . . . . . . . . . . . . . . .<=========> . 29A 21 1917 2011 95

. . . . . . . . . . . . . . . . . .<=========> . 29B 22 1917 2011 95

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

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: FINAL 13:55 Wed 14 Mar 2012 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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1900 .047 6 1950 .374 21 2000 -1.228 22 1

1901 -.304 6 1951 .076 22 2001 .236 22

1902 -.506 7 1952 .490 22 2002 .573 22

1903 .600 7 1953 1.629 22 2003 .265 22

1904 .892 8 1954 .994 22 2004 .204 22

1905 1.490 8 1955 .573 22 2005 -.937 22

1906 1.675 9 1956 -.322 22 2006 .344 22

1907 -.332 9 1957 -.930 22 2007 .888 22

1908 -.043 10 1958 .466 22 2008 .263 22

1909 -.035 10 1959 .711 22 2009 .882 22

1910 -.026 10 1960 -.281 22 2010 1.792 22

1911 -1.588 10 1961 .438 22 2011 -1.887 22

1912 -.320 10 1962 .454 22

1913 -.314 10 1963 .465 22

1914 .614 10 1964 1.731 22

1915 2.140 10 1965 .314 22

1916 .974 10 1966 -1.583 22

1917 -1.277 13 1967 -1.024 22

1918 .494 13 1968 .225 22

1919 -.993 13 1969 -1.436 22

1920 -.925 13 1970 -.689 22

1921 -.839 14 1971 -.338 22

1922 .239 14 1972 -1.148 22

1923 -1.530 14 1973 .467 22

1924 .159 14 1974 1.838 22

1925 -.159 14 1975 -.396 22

1926 -.762 14 1976 -1.082 22

1877 .290 1 1927 .901 15 1977 -.545 22

1878 1.245 1 1928 -.288 15 1978 .117 22

1879 2.909 1 1929 .796 16 1979 .609 22

1880 .009 1 1930 .478 16 1980 .895 22

1881 -.107 1 1931 1.232 16 1981 .499 22

1882 -2.073 1 1932 1.336 17 1982 .152 22

1883 .381 1 1933 1.408 19 1983 .950 22

1884 -1.360 1 1934 -.423 19 1984 .440 22

1885 .528 2 1935 -.074 20 1985 .537 22

1886 .545 2 1936 .935 20 1986 .925 22

1887 -.525 2 1937 .065 20 1987 .094 22

1888 -.118 3 1938 .895 20 1988 .328 22

1889 -.248 3 1939 -.189 20 1989 .708 22

1890 -2.429 3 1940 -1.061 20 1990 1.345 22

1891 .019 3 1941 -.392 20 1991 -2.070 22

1892 -.872 3 1942 .732 20 1992 -.076 22

1893 .084 3 1943 -.466 20 1993 .688 22

1894 -.707 3 1944 -.694 20 1994 -1.184 22

1895 -.023 4 1945 .466 20 1995 -.158 22

1896 .342 4 1946 -.855 21 1996 .931 22

1897 -.634 4 1947 -2.901 21 1997 -.414 22

1898 .191 4 1948 -1.821 21 1998 -2.215 22 1

1899 .990 4 1949 -.842 21 1999 -3.018 22 2

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PART 4: Master Bar Plot: FINAL 13:55 Wed 14 Mar 2012 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

1900-----@ 1950------A 2000-e

1901---a 1951-----@ 2001------A

1902--b 1952-------B 2002-------B

1903--------B 1953----------G 2003------A

1904---------D 1954---------D 2004-----A

1905----------F 1955-------B 2005-d

1906----------G 1956---a 2006------A

1907---a 1957-d 2007---------D

1908----@ 1958-------B 2008------A

1909----@ 1959--------C 2009---------D

1910----@ 1960---a 2010----------G

1911f 1961-------B 2011h

1912---a 1962-------B

1913---a 1963-------B

1914--------B 1964----------G

1915----------I 1965------A

1916---------D 1966f

1917-e 1967-d

1918-------B 1968------A

1919-d 1969-f

1920-d 1970--c

1921--c 1971---a

1922------A 1972-e

1923f 1973-------B

1924-----A 1974----------G

1925----a 1975---b

1926--c 1976-d

1877------A 1927---------D 1977--b

1878---------E 1928---a 1978-----@

1879----------L 1929--------C 1979--------B

1880----@ 1930-------B 1980---------D

1881----@ 1931---------E 1981-------B

1882h 1932----------E 1982-----A

1883------B 1933----------F 1983---------D

1884-e 1934---b 1984-------B

1885-------B 1935----@ 1985-------B

1886-------B 1936---------D 1986---------D

1887--b 1937-----@ 1987-----@

1888----@ 1938---------D 1988------A

1889---a 1939----a 1989--------C

1890j 1940-d 1990----------E

1891-----@ 1941---b 1991h

1892--c 1942--------C 1992----@

1893-----@ 1943---b 1993--------C

1894--c 1944--c 1994-e

1895----@ 1945-------B 1995----a

1896------A 1946--c 1996---------D

1897--c 1947l 1997---b

1898-----A 1948g 1998i

1899---------D 1949--c 1999l

PART 5: CORRELATION OF SERIES BY SEGMENTS: FINAL 13:55 Wed 14 Mar 2012 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 2A 1927 2011 .63 .76 .75

2 2B 1906 2011 .61 .63 .74 .80

3 07A 1946 2011 .66 .81 .83

4 07B 1932 2011 .76 .84 .88

5 11A 1895 2011 .46 .51 .67 .61 .60

6 11B 1929 2011 .57 .52 .53

7 15A 1900 2011 .60 .64 .75 .77

8 15B 1902 2011 .81 .77 .48 .59

9 17A 1877 2011 .48 .67 .52 .54 .68

10 17B 1900 2011 .57 .49 .56 .68

11 21A 1921 2011 .67 .66 .68 .75

12 21B 1933 2011 .69 .62 .72

13 22A 1904 2011 .78 .73 .73 .75

14 22B 1917 2011 .55 .68 .44 .52

15 24A 1885 2011 .39 .61 .66 .84 .88

16 24B 1935 2011 .61 .66 .66

17 26A 1888 2011 .68 .67 .71 .77 .79

18 26B 1908 2011 .71 .80 .74 .80

19 27A 1951 2011 .55 .66

20 27B 1933 2011 .33 .50 .64

21 29A 1917 2011 .38B .43 .66 .77

22 29B 1917 2011 .23B .23B .61 .74

Av segment correlation .50 .60 .61 .65 .72

PART 6: POTENTIAL PROBLEMS: FINAL 13:55 Wed 14 Mar 2012 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

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

2A 1927 to 2011 85 years Series 1

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

Lower 1937> -.012 1933< -.012 1981< -.011 1976> -.011 1994> -.005 1970> -.004 Higher 1991 .053 1999 .008

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

1969 -5.2 SD

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

2B 1906 to 2011 106 years Series 2

[B] Entire series, effect on correlation ( .710) is:

Lower 1974< -.019 1921> -.017 1923< -.016 1919> -.012 1920> -.010 1922< -.009 Higher 2011 .042 1999 .010

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

1921 +3.4 SD

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07A 1946 to 2011 66 years Series 3

[B] Entire series, effect on correlation ( .687) is:

Lower 1949< -.117 1998> -.025 1946> -.009 1978< -.008 1947> -.006 1961< -.005 Higher 1991 .063 2011 .025

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07B 1932 to 2011 80 years Series 4

[B] Entire series, effect on correlation ( .863) is:

Lower 1975> -.010 1959< -.008 1978< -.008 1949> -.005 1965> -.005 1977< -.004 Higher 2011 .017 1991 .016

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11A 1895 to 2011 117 years Series 5

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

Lower 1904< -.045 1975> -.014 1920< -.012 2011> -.009 1940> -.008 1897< -.008 Higher 1998 .022 1911 .010

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

1998 -2.215 22 1

1999 -3.018 22 2

2000 -1.228 22 1

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

11B 1929 to 2011 83 years Series 6

[B] Entire series, effect on correlation ( .569) is:

Lower 1929< -.048 1969< -.034 1991> -.029 1975> -.021 1980< -.013 1997> -.008 Higher 1998 .025 2011 .018

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

1999 -3.018 22 2

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

1969 -5.4 SD

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15A 1900 to 2011 112 years Series 7

[B] Entire series, effect on correlation ( .703) is:

Lower 1939> -.016 1928< -.016 1998> -.012 1916< -.007 1926> -.006 1999> -.005 Higher 1991 .042 2011 .022

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15B 1902 to 2011 110 years Series 8

[B] Entire series, effect on correlation ( .670) is:

Lower 1988< -.110 1907> -.009 1991> -.009 1903< -.009 1973< -.007 1985< -.006 Higher 2011 .032 1947 .012

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

1988 -5.4 SD

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17A 1877 to 2011 135 years Series 9

[\*] Early part of series cannot be checked from 1877 to 1884 -- not matched by another series

[B] Entire series, effect on correlation ( .573) is:

Lower 1887< -.037 1999> -.017 1892> -.011 1959< -.009 1957> -.009 1935< -.008 Higher 1991 .045 2011 .031

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17B 1900 to 2011 112 years Series 10

[B] Entire series, effect on correlation ( .605) is:

Lower 1955< -.031 1947> -.024 1975< -.022 1990< -.013 1922< -.013 1966> -.013 Higher 2011 .036 1991 .014

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

1947 +3.3 SD

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21A 1921 to 2011 91 years Series 11

[B] Entire series, effect on correlation ( .734) is:

Lower 1954< -.013 1984< -.013 1997> -.012 1969> -.009 1970< -.008 1977< -.007 Higher 2011 .034 1998 .014

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21B 1933 to 2011 79 years Series 12

[B] Entire series, effect on correlation ( .729) is:

Lower 1991> -.042 1948> -.012 1983< -.008 1951< -.008 1982< -.008 1957> -.007 Higher 2011 .055 1947 .018

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22A 1904 to 2011 108 years Series 13

[B] Entire series, effect on correlation ( .759) is:

Lower 1972> -.018 1999> -.015 1997> -.014 1975> -.010 1989< -.009 1934> -.009 Higher 1991 .034 2011 .019

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22B 1917 to 2011 95 years Series 14

[B] Entire series, effect on correlation ( .536) is:

Lower 1917> -.031 1991> -.029 1994< -.027 1999> -.025 1966> -.014 1956< -.014 Higher 1947 .032 2011 .022

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24A 1885 to 2011 127 years Series 15

[B] Entire series, effect on correlation ( .664) is:

Lower 1887> -.047 1893< -.017 1925< -.011 1903< -.009 1928> -.007 1947< -.007 Higher 1991 .041 2011 .022

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

1887 +4.3 SD; 1947 -4.7 SD

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24B 1935 to 2011 77 years Series 16

[B] Entire series, effect on correlation ( .633) is:

Lower 1962< -.021 1991> -.017 1949> -.013 1940> -.013 1994> -.009 1948> -.008 Higher 1999 .020 1964 .013

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

1949 +3.1 SD

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26A 1888 to 2011 124 years Series 17

[B] Entire series, effect on correlation ( .729) is:

Lower 1940< -.025 1994< -.018 1900< -.010 1888> -.009 1975> -.006 1893> -.006 Higher 1991 .025 2011 .015

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

1940 -4.5 SD

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26B 1908 to 2011 104 years Series 18

[B] Entire series, effect on correlation ( .768) is:

Lower 1975> -.021 1976< -.016 1910< -.012 1954< -.009 1911> -.008 1996< -.008 Higher 2011 .032 1991 .029

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27A 1951 to 2011 61 years Series 19

[B] Entire series, effect on correlation ( .630) is:

Lower 1952< -.031 1983< -.028 1969> -.019 1966> -.013 1991> -.012 1998> -.011 Higher 2011 .050 1999 .036

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

1978 +3.0 SD

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27B 1933 to 2011 79 years Series 20

[B] Entire series, effect on correlation ( .590) is:

Lower 1998> -.037 1975> -.020 1934> -.020 1976> -.016 2000> -.013 1966> -.013 Higher 2011 .095 1991 .079

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

1976 +3.4 SD; 2000 +3.5 SD

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29A 1917 to 2011 95 years Series 21

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

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

1917 1966 9 -.18 -.03 -.22 -.19 .14 -.16 -.25 .07 -.01 -.24 .38| .00 .03 -.06 .08 -.11 .21 .04 .11 .38\* .04

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

Lower 1944> -.020 1932< -.017 1998> -.015 1921> -.015 1956> -.014 1994> -.013 Higher 2011 .062 1991 .051

1917 to 1966 segment:

Lower 1944> -.049 1932< -.044 1921> -.038 1956> -.035 1924< -.026 1938< -.026 Higher 1917 .055 1919 .025

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

1921 +3.2 SD; 1944 +3.3 SD

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29B 1917 to 2011 95 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

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

1917 1966 3 .08 .19 -.10 -.11 -.25 -.08 .18 -.02 -.23 -.07 .23|-.22 .21 .27\* .09 .13 -.04 .04 -.08 -.01 -.10

1925 1974 3 -.02 .16 -.20 -.06 -.09 .11 .06 .02 -.34 -.08 .23|-.20 .02 .28\* .19 .07 .07 -.10 -.13 -.07 -.02

[B] Entire series, effect on correlation ( .478) is:

Lower 1944< -.080 1947> -.021 1966> -.020 1921< -.014 1949> -.011 1955< -.011 Higher 1991 .032 2011 .028

1917 to 1966 segment:

Lower 1944< -.062 1966> -.035 1947> -.033 1949> -.017 1946> -.016 1917> -.015 Higher 1932 .015 1942 .015

1925 to 1974 segment:

Lower 1944< -.070 1966> -.040 1947> -.037 1949> -.022 1946> -.018 1955< -.015 Higher 1972 .021 1943 .016

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

1944 -7.1 SD; 1947 +3.6 SD; 1949 +3.0 SD

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PART 7: DESCRIPTIVE STATISTICS: FINAL 13:55 Wed 14 Mar 2012 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 2A 1927 2011 85 3 0 .721 2.49 6.62 1.203 .727 .289 2.52 .402 -.063 1

2 2B 1906 2011 106 4 0 .710 2.22 4.74 .945 .604 .297 2.59 .458 .003 1

3 07A 1946 2011 66 3 0 .687 2.77 4.05 .572 .290 .174 2.47 .451 -.042 1

4 07B 1932 2011 80 3 0 .863 2.31 3.73 .623 .418 .205 2.68 .615 .087 2

5 11A 1895 2011 117 5 0 .549 1.56 3.54 .756 .754 .311 2.49 .437 -.010 1

6 11B 1929 2011 83 3 0 .569 1.62 3.49 .734 .727 .333 2.67 .387 .016 1

7 15A 1900 2011 112 4 0 .703 1.89 6.55 1.090 .870 .170 2.61 .368 -.035 1

8 15B 1902 2011 110 4 0 .670 1.63 3.63 .547 .659 .204 2.59 .405 -.005 1

9 17A 1877 2011 135 5 0 .573 1.55 10.26 1.411 .894 .247 2.80 .555 .020 1

10 17B 1900 2011 112 4 0 .605 1.18 2.12 .424 .677 .232 2.58 .398 -.003 1

11 21A 1921 2011 91 4 0 .734 1.79 3.40 .464 .589 .181 2.59 .497 .025 2

12 21B 1933 2011 79 3 0 .729 1.48 2.33 .390 .576 .187 2.60 .485 .043 2

13 22A 1904 2011 108 4 0 .759 1.81 4.31 .814 .696 .250 2.63 .397 -.065 1

14 22B 1917 2011 95 4 0 .536 2.04 5.22 .831 .498 .267 2.64 .377 -.025 2

15 24A 1885 2011 127 5 0 .664 1.56 6.62 1.033 .899 .242 2.41 .348 .031 1

16 24B 1935 2011 77 3 0 .633 1.31 2.33 .441 .667 .241 2.67 .451 .098 4

17 26A 1888 2011 124 5 0 .729 1.45 5.30 1.113 .878 .262 2.67 .447 -.038 1

18 26B 1908 2011 104 4 0 .768 1.17 3.75 .712 .835 .256 2.65 .499 .013 1

19 27A 1951 2011 61 2 0 .630 3.30 6.13 .967 .365 .240 2.72 .569 -.035 1

20 27B 1933 2011 79 3 0 .590 2.50 5.27 .939 .658 .228 2.56 .411 -.093 1

21 29A 1917 2011 95 4 1 .634 1.63 4.63 .685 .704 .246 2.73 .472 -.085 2

22 29B 1917 2011 95 4 2 .478 1.48 2.95 .530 .696 .241 2.56 .375 .067 1

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Total or mean: 2141 83 3 .659 1.79 10.26 .806 .693 .243 2.80 .442 -.004

- = [ COFECHA 3 COF ] = -