[] Dendrochronology Program Library Run 149 Program COF 13:48 Fri 08 Apr 2011 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 27858

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

File of DATED series: 149\_EQU

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 30 years lagged successively by 15 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 .4226

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 1920 to 2010 91 years

Continuous time span is 1920 to 2010 91 years

Portion with two or more series is 1921 to 2010 90 years

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

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

\*O\* Master series 1920 2010 91 yrs \*O\*

\*F\* Total rings in all series 1680 \*F\*

\*E\* Total dated rings checked 1679 \*E\*

\*C\* Series intercorrelation .672 \*C\*

\*H\* Average mean sensitivity .308 \*H\*

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

\*\*\* Mean length of series 76.4 \*\*\*

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

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

312B 1 absent rings: 2004

427A 1 absent rings: 1981

2 absent rings .119%

PART 2: TIME PLOT OF TREE-RING SERIES: 13:48 Fri 08 Apr 2011 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

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

. . . . . . . . . . . . . . . . . . <=======> . 312A 1 1937 2010 74

. . . . . . . . . . . . . . . . . . <=======> . 312B 2 1935 2010 76

. . . . . . . . . . . . . . . . . . <========> . 313A 3 1925 2010 86

. . . . . . . . . . . . . . . . . . <========> . 313B 4 1928 2010 83

. . . . . . . . . . . . . . . . . . <=======> . 316A 5 1938 2010 73

. . . . . . . . . . . . . . . . . . <======> . 316B 6 1945 2010 66

. . . . . . . . . . . . . . . . . . <========> . 317A 7 1924 2010 87

. . . . . . . . . . . . . . . . . . <======> . 317B 8 1940 2010 71

. . . . . . . . . . . . . . . . . . <=======> . 318A 9 1937 2010 74

. . . . . . . . . . . . . . . . . . <========> . 318B 10 1920 2010 91

. . . . . . . . . . . . . . . . . . <========> . 319A 11 1925 2010 86

. . . . . . . . . . . . . . . . . . <========> . 319B 12 1928 2010 83

. . . . . . . . . . . . . . . . . . <========> . 320A 13 1925 2010 86

. . . . . . . . . . . . . . . . . . <========> . 320B 14 1926 2010 85

. . . . . . . . . . . . . . . . . . <========> . 321A 15 1921 2010 90

. . . . . . . . . . . . . . . . . . <=======> . 321B 16 1930 2010 81

. . . . . . . . . . . . . . . . . . . <===> . 425A 17 1974 2010 37

. . . . . . . . . . . . . . . . . . . <===> . 425B 18 1979 2010 32

. . . . . . . . . . . . . . . . . . <=======> . 426A 19 1933 2010 78

. . . . . . . . . . . . . . . . . . <=======> . 426B 20 1935 2010 76

. . . . . . . . . . . . . . . . . . <========> . 427A 21 1928 2010 83

. . . . . . . . . . . . . . . . . . <========> . 427B 22 1929 2010 82

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

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: 13:48 Fri 08 Apr 2011 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

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

1950 -.765 20 2000 -.555 22

1951 -.156 20 2001 1.279 22

1952 .307 20 2002 1.746 22

1953 .684 20 2003 -.386 22

1954 .807 20 2004 -2.136 22 1

1955 1.590 20 2005 -.644 22

1956 -1.691 20 2006 -.255 22

1957 .205 20 2007 1.343 22

1958 .748 20 2008 .112 22

1959 .145 20 2009 -.478 22

1960 -1.731 20 2010 1.254 22

1961 .097 20

1962 -.508 20

1963 .167 20

1964 .740 20

1965 .627 20

1966 -.790 20

1967 -.346 20

1968 -.801 20

1969 -.623 20

1920 -2.374 1 1970 .750 20

1921 -1.291 2 1971 1.991 20

1922 1.189 2 1972 .518 20

1923 -.565 2 1973 .300 20

1924 .247 3 1974 -.154 21

1925 .233 6 1975 1.241 21

1926 -1.410 7 1976 -.470 21

1927 -.291 7 1977 -.395 21

1928 -.601 10 1978 -.648 21

1929 .432 11 1979 -.177 22

1930 .264 12 1980 1.056 22

1931 .490 12 1981 -1.845 22 1

1932 1.918 12 1982 -.390 22

1933 -.351 13 1983 .418 22

1934 .628 13 1984 -1.016 22

1935 -.123 15 1985 -.549 22

1936 -.089 15 1986 -1.191 22

1937 -.188 17 1987 1.026 22

1938 .535 18 1988 1.479 22

1939 .864 18 1989 -.201 22

1940 -.739 19 1990 .795 22

1941 1.607 19 1991 .617 22

1942 -.109 19 1992 .709 22

1943 -1.076 19 1993 1.231 22

1944 -.347 19 1994 .048 22

1945 .009 20 1995 .871 22

1946 -.614 20 1996 -2.743 22

1947 .972 20 1997 -.275 22

1948 -2.797 20 1998 -1.150 22

1949 1.024 20 1999 .715 22

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PART 4: Master Bar Plot: 13:48 Fri 08 Apr 2011 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--c 2000--b

1951----a 2001---------E

1952------A 2002----------G

1953--------C 2003---b

1954--------C 2004i

1955----------F 2005--c

1956g 2006----a

1957------A 2007---------E

1958--------C 2008-----@

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

1960g 2010---------E

1961-----@

1962--b

1963------A

1964--------C

1965-------C

1966--c

1967---a

1968--c

1969--b

1920i 1970--------C

1921-e 1971----------H

1922---------E 1972-------B

1923--b 1973------A

1924------A 1974----a

1925------A 1975---------E

1926-f 1976---b

1927----a 1977---b

1928--b 1978--c

1929------B 1979----a

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

1931-------B 1981g

1932----------H 1982---b

1933---a 1983------B

1934-------C 1984-d

1935----@ 1985--b

1936-----@ 1986-e

1937----a 1987---------D

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

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

1940--c 1990--------C

1941----------F 1991-------B

1942----@ 1992--------C

1943-d 1993---------E

1944---a 1994-----@

1945-----@ 1995--------C

1946--b 1996k

1947---------D 1997----a

1948k 1998-e

1949---------D 1999--------C

PART 5: CORRELATION OF SERIES BY SEGMENTS: 13:48 Fri 08 Apr 2011 Page 5

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Correlations of 30-year dated segments, lagged 15 years

Flags: A = correlation under .4226 but highest as dated; B = correlation higher at other than dated position

Seq Series Time\_span 1920 1935 1950 1965 1980 1995

1949 1964 1979 1994 2009 2024

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

1 312A 1937 2010 .54 .53 .58 .65 .65

2 312B 1935 2010 .52 .40A .48 .83 .84

3 313A 1925 2010 .59 .63 .70 .58 .64 .64

4 313B 1928 2010 .52 .59 .68 .64 .77 .77

5 316A 1938 2010 .75 .70 .70 .85 .87

6 316B 1945 2010 .82 .76 .75 .80 .81

7 317A 1924 2010 .59 .76 .74 .68 .86 .86

8 317B 1940 2010 .78 .78 .77 .81 .81

9 318A 1937 2010 .61 .76 .77 .77 .79

10 318B 1920 2010 .69 .81 .72 .77 .87 .86

11 319A 1925 2010 .76 .55 .30B .59 .70 .71

12 319B 1928 2010 .58 .55 .67 .74 .77 .77

13 320A 1925 2010 .35A .65 .45 .51 .82 .82

14 320B 1926 2010 .43 .50 .38A .57 .82 .81

15 321A 1921 2010 .50 .67 .47 .56 .86 .86

16 321B 1930 2010 .74 .76 .78 .78 .85 .85

17 425A 1974 2010 .42 .75 .75

18 425B 1979 2010 .50 .48 .44

19 426A 1933 2010 .75 .76 .68 .73 .82 .82

20 426B 1935 2010 .78 .72 .84 .90 .90

21 427A 1928 2010 .61 .57 .46 .52 .81 .81

22 427B 1929 2010 .64 .75 .62 .49 .79 .86

Av segment correlation .60 .67 .61 .63 .78 .79

PART 6: POTENTIAL PROBLEMS: 13:48 Fri 08 Apr 2011 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 30-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

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

312A 1937 to 2010 74 years Series 1

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

Lower 1962< -.059 1981> -.016 1960> -.014 1937> -.011 2005< -.011 1982< -.011 Higher 2004 .021 1948 .011

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

312B 1935 to 2010 76 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

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

1950 1979 0 .28 -.11 .33 -.03 .31 -.05 .03 -.10 .01 -.32 .40\*-.22 -.24 .00 .07 -.46 .11 -.06 -.05 .18 .39

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

Lower 1936< -.044 1960> -.028 1942< -.023 1984> -.016 1941< -.016 1970< -.014 Higher 1948 .051 1956 .024

1950 to 1979 segment:

Lower 1960> -.111 1962> -.043 1976> -.036 1970< -.036 1977> -.024 1972< -.018 Higher 1956 .160 1955 .041

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

2004 -2.136 22 1

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

1942 -4.7 SD

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

313A 1925 to 2010 86 years Series 3

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

Lower 1938< -.018 1933> -.017 1998> -.010 1993< -.010 1990< -.009 1965< -.008 Higher 1948 .014 1932 .013

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

1956 -5.7 SD

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

313B 1928 to 2010 83 years Series 4

[B] Entire series, effect on correlation ( .629) is:

Lower 1948> -.024 1933> -.015 1994< -.014 1935< -.011 1928> -.011 1937< -.009 Higher 2004 .025 1956 .025

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316A 1938 to 2010 73 years Series 5

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

Lower 1987< -.012 1940> -.010 1961< -.008 1973> -.007 1998> -.007 1969> -.005 Higher 1996 .035 1981 .015

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

316B 1945 to 2010 66 years Series 6

[B] Entire series, effect on correlation ( .804) is:

Lower 2003> -.017 1960< -.015 1989> -.012 1961< -.011 2004> -.009 2009< -.006 Higher 1996 .031 1948 .028

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

317A 1924 to 2010 87 years Series 7

[B] Entire series, effect on correlation ( .731) is:

Lower 1933> -.020 1942< -.017 1967> -.011 1986> -.009 1935> -.008 1926< -.008 Higher 1996 .019 1981 .018

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

317B 1940 to 2010 71 years Series 8

[B] Entire series, effect on correlation ( .792) is:

Lower 1940> -.019 1986> -.015 1945< -.011 1999< -.008 1967> -.008 1943> -.007 Higher 1948 .031 2004 .013

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318A 1937 to 2010 74 years Series 9

[B] Entire series, effect on correlation ( .704) is:

Lower 1946< -.037 1937< -.013 1947< -.009 2003< -.007 1966> -.007 1996> -.007 Higher 1981 .022 1960 .015

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318B 1920 to 2010 91 years Series 10

[\*] Early part of series cannot be checked from 1920 to 1920 -- not matched by another series

[B] Entire series, effect on correlation ( .758) is:

Lower 1923> -.025 1977> -.011 1961< -.008 1924> -.007 1989< -.006 1984> -.006 Higher 1948 .022 1996 .016

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319A 1925 to 2010 86 years Series 11

[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 1979 5 .00 -.07 .10 .32 .03 -.07 -.09 .09 -.23 -.06 .30| .01 .04 -.08 -.12 .37\*-.13 .00 -.16 .18 .15

[B] Entire series, effect on correlation ( .644) is:

Lower 1960> -.044 1955< -.017 1992< -.015 2006< -.011 2007< -.011 1967< -.009 Higher 1996 .057 1948 .051

1950 to 1979 segment:

Lower 1960> -.171 1955< -.051 1962> -.019 1967< -.017 1951< -.015 1968> -.013 Higher 1971 .073 1975 .047

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

1960 +3.4 SD

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319B 1928 to 2010 83 years Series 12

[B] Entire series, effect on correlation ( .658) is:

Lower 1940< -.020 1939< -.015 1928< -.013 1946> -.011 1933> -.011 1958< -.011 Higher 1996 .040 1956 .027

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320A 1925 to 2010 86 years Series 13

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

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

1925 1954 0 - - - - - .07 -.16 .01 .01 -.33 .35\*-.10 .14 .03 .04 -.06 -.14 .10 -.20 -.06 .23

[B] Entire series, effect on correlation ( .497) is:

Lower 1933< -.183 1956> -.022 1977> -.011 1976> -.007 1965< -.006 1978> -.005 Higher 2004 .025 1996 .020

1925 to 1954 segment:

Lower 1933< -.349 1948> -.008 1949< -.008 1928> -.008 1947< -.005 1935> -.005 Higher 1926 .033 1932 .027

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

1932 1933 -4.0 SD 1933 1934 5.2 SD

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

1933 -8.0 SD

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320B 1926 to 2010 85 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

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

1950 1979 0 .00 -.04 .01 -.04 .32 .03 .25 -.04 -.06 -.05 .38\*-.15 -.29 -.09 -.19 -.06 -.11 -.08 .30 -.11 .07

[B] Entire series, effect on correlation ( .571) is:

Lower 1933< -.066 1956> -.030 1977> -.015 1981> -.014 1935< -.012 1952< -.010 Higher 1996 .058 1941 .013

1950 to 1979 segment:

Lower 1956> -.106 1977> -.063 1952< -.042 1973< -.018 1951< -.017 1965< -.015 Higher 1960 .038 1971 .037

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

1933 -5.3 SD

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321A 1921 to 2010 90 years Series 15

[B] Entire series, effect on correlation ( .638) is:

Lower 1944< -.031 1933> -.023 1956> -.019 1926> -.017 1923< -.016 1977> -.013 Higher 1996 .057 1948 .051

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321B 1930 to 2010 81 years Series 16

[B] Entire series, effect on correlation ( .774) is:

Lower 1934< -.020 1943> -.015 1964< -.012 1940> -.009 1988< -.008 1968> -.007 Higher 1996 .025 1948 .024

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425A 1974 to 2010 37 years Series 17

[B] Entire series, effect on correlation ( .485) is:

Lower 1977< -.236 1981> -.019 1986> -.009 1978> -.009 1974> -.009 1976> -.007 Higher 1996 .067 2004 .045

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

1977 -4.7 SD

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425B 1979 to 2010 32 years Series 18

[B] Entire series, effect on correlation ( .450) is:

Lower 2003> -.050 1986> -.032 2010< -.027 1997< -.022 2009> -.020 1983< -.020 Higher 2004 .098 1981 .042

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426A 1933 to 2010 78 years Series 19

[B] Entire series, effect on correlation ( .763) is:

Lower 1956> -.017 1989> -.015 1936> -.013 1976> -.010 1935> -.009 1940< -.009 Higher 1948 .039 1996 .015

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426B 1935 to 2010 76 years Series 20

[B] Entire series, effect on correlation ( .815) is:

Lower 1960> -.013 1935> -.010 1936> -.009 1978< -.006 1956> -.006 1962> -.005 Higher 1948 .015 1981 .013

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427A 1928 to 2010 83 years Series 21

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

Lower 1956> -.029 1943> -.018 1976> -.015 1962< -.015 1967> -.013 1942> -.012 Higher 1996 .028 1948 .023

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

1981 -1.845 22 1

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

1981 -5.4 SD

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427B 1929 to 2010 82 years Series 22

[B] Entire series, effect on correlation ( .661) is:

Lower 1930< -.055 1962< -.021 1980< -.019 1942> -.018 1966> -.017 1976> -.012 Higher 1996 .048 1948 .041

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

1962 -4.6 SD

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PART 7: DESCRIPTIVE STATISTICS: 13:48 Fri 08 Apr 2011 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 312A 1937 2010 74 5 0 .592 1.27 5.33 1.354 .949 .304 2.80 .506 .064 1

2 312B 1935 2010 76 5 1 .596 1.46 6.89 1.852 .965 .402 2.85 .612 -.077 1

3 313A 1925 2010 86 6 0 .605 1.87 4.37 .936 .875 .234 2.49 .333 -.090 1

4 313B 1928 2010 83 6 0 .629 1.37 3.86 1.065 .910 .290 2.54 .431 -.002 1

5 316A 1938 2010 73 5 0 .784 1.07 3.68 .601 .768 .285 2.74 .445 -.051 3

6 316B 1945 2010 66 5 0 .804 1.05 2.98 .666 .779 .302 2.61 .508 -.055 1

7 317A 1924 2010 87 6 0 .731 1.52 2.82 .788 .834 .259 2.59 .577 -.019 1

8 317B 1940 2010 71 5 0 .792 1.99 3.30 .562 .435 .262 2.58 .524 -.073 1

9 318A 1937 2010 74 5 0 .704 1.57 3.50 .849 .758 .293 2.65 .565 -.005 1

10 318B 1920 2010 91 6 0 .758 1.26 3.75 1.020 .933 .333 2.70 .515 -.017 1

11 319A 1925 2010 86 6 1 .644 1.17 5.29 .841 .829 .310 2.64 .480 -.055 2

12 319B 1928 2010 83 6 0 .658 .96 2.86 .616 .797 .372 2.74 .555 -.104 1

13 320A 1925 2010 86 6 1 .497 1.34 5.34 1.479 .841 .375 2.40 .298 -.094 2

14 320B 1926 2010 85 6 1 .571 .97 4.32 .905 .720 .355 2.62 .411 -.077 1

15 321A 1921 2010 90 6 0 .638 .76 3.11 .699 .895 .355 2.66 .463 -.053 1

16 321B 1930 2010 81 6 0 .774 1.24 3.20 .718 .832 .270 2.72 .511 -.090 1

17 425A 1974 2010 37 3 0 .485 2.48 4.20 .762 .651 .209 2.32 .427 -.032 1

18 425B 1979 2010 32 3 0 .450 2.42 3.66 .537 .428 .178 2.55 .690 -.018 1

19 426A 1933 2010 78 6 0 .763 1.05 2.82 .757 .894 .284 2.53 .493 -.023 1

20 426B 1935 2010 76 5 0 .815 1.19 2.54 .732 .859 .298 2.49 .391 -.061 1

21 427A 1928 2010 83 6 0 .656 1.06 3.43 .957 .945 .352 2.46 .364 -.018 1

22 427B 1929 2010 82 6 0 .661 1.07 3.37 1.042 .956 .304 2.57 .575 -.078 2

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Total or mean: 1680 119 4 .672 1.31 6.89 .914 .830 .308 2.85 .479 -.048

- = [ COFECHA 149 COF ] = -