[] Dendrochronology Program Library Run 171 Program COF 14:56 Wed 06 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 27856

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

File of DATED series: 171\_HUB

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 1906 to 2010 105 years

Continuous time span is 1906 to 2010 105 years

Portion with two or more series is 1918 to 2010 93 years

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

\*C\* Number of dated series 12 \*C\*

\*O\* Master series 1906 2010 105 yrs \*O\*

\*F\* Total rings in all series 1017 \*F\*

\*E\* Total dated rings checked 1005 \*E\*

\*C\* Series intercorrelation .567 \*C\*

\*H\* Average mean sensitivity .296 \*H\*

\*A\* Segments, possible problems 12 \*A\*

\*\*\* Mean length of series 84.8 \*\*\*

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

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

145B 2 absent rings: 1982 1984

2 absent rings .197%

PART 2: TIME PLOT OF TREE-RING SERIES: 14:56 Wed 06 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

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

. . . . . . . . . . . . . . . . . .<=========> . 141A 1 1918 2010 93

. . . . . . . . . . . . . . . . . . <========> . 141B 2 1927 2010 84

. . . . . . . . . . . . . . . . . . <========> . 142A 3 1926 2010 85

. . . . . . . . . . . . . . . . . . <========> . 142B 4 1926 2010 85

. . . . . . . . . . . . . . . . . . <========> . 143A 5 1924 2010 87

. . . . . . . . . . . . . . . . . . <========> . 143B 6 1922 2010 89

. . . . . . . . . . . . . . . . . <==========> . 144A 7 1906 2010 105

. . . . . . . . . . . . . . . . . .<=========> . 144B 8 1919 2010 92

. . . . . . . . . . . . . . . . . . <=======> . 145A 9 1931 2010 80

. . . . . . . . . . . . . . . . . . <=======> . 145B 10 1936 2010 75

. . . . . . . . . . . . . . . . . . <======> . 899A 11 1946 2010 65

. . . . . . . . . . . . . . . . . . <=======> . 899B 12 1934 2010 77

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

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: 14:56 Wed 06 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

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1950 -.219 12 2000 -1.047 12

1951 .832 12 2001 -.350 12

1952 -.191 12 2002 .375 12

1953 -2.387 12 2003 -3.124 12

1954 1.205 12 2004 -.404 12

1955 .275 12 2005 -.799 12

1906 .638 1 1956 .216 12 2006 .353 12

1907 .710 1 1957 1.779 12 2007 .546 12

1908 .489 1 1958 1.192 12 2008 .647 12

1909 -1.238 1 1959 .650 12 2009 1.481 12

1910 -2.315 1 1960 -.346 12 2010 .531 12

1911 -1.976 1 1961 .541 12

1912 -.167 1 1962 -1.002 12

1913 1.389 1 1963 -.530 12

1914 .895 1 1964 -.495 12

1915 1.517 1 1965 -.739 12

1916 1.081 1 1966 -1.892 12

1917 .235 1 1967 -.255 12

1918 -1.965 2 1968 -.503 12

1919 -1.217 3 1969 -.341 12

1920 .926 3 1970 -.323 12

1921 .896 3 1971 .271 12

1922 -.686 4 1972 .312 12

1923 -2.162 4 1973 .215 12

1924 1.207 5 1974 .517 12

1925 1.423 5 1975 .885 12

1926 .908 7 1976 1.878 12

1927 1.420 8 1977 1.322 12

1928 .627 8 1978 .062 12

1929 -.353 8 1979 .767 12

1930 .375 8 1980 .673 12

1931 -.011 9 1981 -.662 12

1932 -.021 9 1982 -1.316 12 1

1933 -1.309 9 1983 -1.237 12

1934 -2.169 10 1984 -1.159 12 1

1935 -.238 10 1985 -1.031 12

1936 .072 11 1986 -.779 12

1937 -.086 11 1987 .059 12

1938 .343 11 1988 .123 12

1939 -.342 11 1989 .482 12

1940 -.758 11 1990 .820 12

1941 -.327 11 1991 .373 12

1942 -.843 11 1992 1.306 12

1943 .402 11 1993 .667 12

1944 -.053 11 1994 .970 12

1945 1.495 11 1995 .817 12

1946 .103 12 1996 .334 12

1947 .630 12 1997 -.002 12

1948 -1.087 12 1998 -.260 12

1949 .501 12 1999 -1.043 12

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PART 4: Master Bar Plot: 14:56 Wed 06 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---a 2000-d

1951--------C 2001---a

1952----a 2002------B

1953j 2003l

1954---------E 2004---b

1955------A 2005--c

1906-------C 1956-----A 2006------A

1907--------C 1957----------G 2007-------B

1908-------B 1958---------E 2008-------C

1909-e 1959-------C 2009----------F

1910i 1960---a 2010-------B

1911h 1961-------B

1912----a 1962-d

1913----------F 1963--b

1914--------D 1964---b

1915----------F 1965--c

1916---------D 1966h

1917-----A 1967---a

1918h 1968---b

1919-e 1969---a

1920---------D 1970---a

1921--------D 1971------A

1922--c 1972------A

1923i 1973-----A

1924---------E 1974-------B

1925----------F 1975--------D

1926--------D 1976----------H

1927----------F 1977----------E

1928-------C 1978-----@

1929---a 1979--------C

1930------A 1980--------C

1931----@ 1981--c

1932----@ 1982-e

1933-e 1983-e

1934i 1984-e

1935---a 1985-d

1936-----@ 1986--c

1937----@ 1987-----@

1938------A 1988-----@

1939---a 1989-------B

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

1941---a 1991------A

1942--c 1992----------E

1943------B 1993--------C

1944----@ 1994---------D

1945----------F 1995--------C

1946-----@ 1996------A

1947-------C 1997----@

1948-d 1998---a

1949-------B 1999-d

PART 5: CORRELATION OF SERIES BY SEGMENTS: 14:56 Wed 06 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 1905 1920 1935 1950 1965 1980 1995

1934 1949 1964 1979 1994 2009 2024

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

1 141A 1918 2010 .31A .38B .35A .56 .52 .79 .78

2 141B 1927 2010 .72 .71 .75 .52 .47 .46

3 142A 1926 2010 .47 .47 .77 .84 .81 .81

4 142B 1926 2010 .52 .56 .60 .63 .81 .82

5 143A 1924 2010 .75 .80 .83 .50 .28A .27A

6 143B 1922 2010 .63 .65 .67 .69 .45 .42A

7 144A 1906 2010 .43 .66 .64 .64 .42 .76 .76

8 144B 1919 2010 .63 .67 .77 .66 .40A .77 .76

9 145A 1931 2010 .55 .55 .75 .86 .86 .86

10 145B 1936 2010 .20B .52 .54 .79 .74

11 899A 1946 2010 .49 .49 .32A .50 .50

12 899B 1934 2010 .31A .40A .47 .39B .52 .51

Av segment correlation .46 .57 .55 .64 .55 .65 .64

PART 6: POTENTIAL PROBLEMS: 14:56 Wed 06 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

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141A 1918 to 2010 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

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

1918 1947 0 .12 .03 .11 .20 .30 .05 -.19 -.28 -.17 .10 .31\* .05 -.27 .01 -.03 .31 -.31 .05 -.18 .09 -.23

1920 1949 -6 .17 -.09 -.04 .12 .39\* .19 -.17 -.20 -.12 .10 .38|-.02 -.16 .06 -.17 .17 -.22 .16 -.16 .18 -.26

1935 1964 0 .16 -.10 -.07 -.03 .16 .18 -.25 .08 -.02 -.02 .35\*-.07 -.06 .04 -.12 -.06 -.25 .25 -.21 .22 -.20

[B] Entire series, effect on correlation ( .516) is:

Lower 1918< -.039 1939< -.038 1922> -.019 1945< -.012 1960> -.009 1943< -.008 Higher 2003 .093 1957 .014

1918 to 1947 segment:

Lower 1918< -.068 1922> -.052 1939< -.023 1945< -.020 1943< -.016 1934> -.011 Higher 1923 .047 1924 .042

1920 to 1949 segment:

Lower 1939< -.115 1922> -.050 1945< -.026 1943< -.020 1949< -.014 1935< -.012 Higher 1923 .052 1924 .038

1935 to 1964 segment:

Lower 1939< -.073 1960> -.026 1945< -.024 1943< -.019 1964< -.013 1949< -.013 Higher 1957 .061 1953 .044

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

1918 -5.1 SD

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141B 1927 to 2010 84 years Series 2

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

Lower 2003> -.044 1941< -.013 1942< -.012 1939> -.009 1969> -.007 2001< -.007 Higher 1953 .045 1945 .011

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142A 1926 to 2010 85 years Series 3

[B] Entire series, effect on correlation ( .679) is:

Lower 1948> -.053 1947< -.025 1953> -.021 2002< -.011 1996> -.010 2000> -.009 Higher 2003 .100 1954 .012

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142B 1926 to 2010 85 years Series 4

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

Lower 1957< -.023 1937> -.016 1936< -.016 1929> -.013 2000> -.012 1972> -.009 Higher 2003 .100 1966 .014

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143A 1924 to 2010 87 years Series 5

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

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

1980 2009 0 -.04 -.11 -.25 -.52 -.26 -.26 -.28 -.11 -.12 .10 .28\* .08 - - - - - - - - -

1981 2010 0 -.06 -.10 -.23 -.42 -.25 -.27 -.28 -.10 -.10 .13 .27\* - - - - - - - - - -

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

Lower 1994< -.075 2003> -.071 1926< -.021 2009< -.007 1939< -.007 1959< -.005 Higher 1953 .035 1948 .022

1980 to 2009 segment:

Lower 1994< -.239 2003> -.071 2009< -.010 1984> -.008 1985> -.007 1996> .000 Higher 1992 .037 1982 .037

1981 to 2010 segment:

Lower 1994< -.240 2003> -.059 2009< -.011 2010> -.009 1984> -.007 1985> -.006 Higher 1992 .038 1982 .036

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143B 1922 to 2010 89 years Series 6

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

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

1981 2010 0 -.27 -.17 -.09 -.24 -.27 -.10 .11 .33 .24 .25 .42\* - - - - - - - - - -

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

Lower 1923> -.029 2003> -.020 1939> -.020 1960> -.019 2006< -.018 1996> -.011 Higher 1953 .041 1948 .016

1981 to 2010 segment:

Lower 2006< -.069 1996> -.043 1994< -.027 1997> -.027 2010> -.020 1987< -.019 Higher 1992 .040 2009 .039

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144A 1906 to 2010 105 years Series 7

[\*] Early part of series cannot be checked from 1906 to 1917 -- not matched by another series

[B] Entire series, effect on correlation ( .597) is:

Lower 1918> -.075 1993< -.025 1953> -.022 1992< -.008 1919< -.007 1978> -.007 Higher 2003 .092 1957 .012

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

1918 1919 -4.1 SD

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

1918 +5.1 SD; 1934 -5.7 SD

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144B 1919 to 2010 92 years Series 8

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

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

1965 1994 0 -.08 -.10 -.18 -.04 .02 .10 .35 .22 .27 -.05 .40\* .16 -.21 -.13 -.19 -.21 -.25 -.40 -.12 -.21 .20

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

Lower 1923< -.018 1966> -.017 1981> -.012 1920< -.011 1946> -.010 1972< -.009 Higher 2003 .025 1948 .014

1965 to 1994 segment:

Lower 1966> -.060 1972< -.049 1981> -.049 1973< -.044 1977< -.032 1993< -.030 Higher 1976 .089 1992 .063

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

1923 -4.7 SD

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145A 1931 to 2010 80 years Series 9

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

Lower 1946> -.018 2006< -.014 1960< -.013 1937< -.013 1948> -.012 1938< -.010 Higher 2003 .103 1953 .010

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145B 1936 to 2010 75 years Series 10

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

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1936 1965 2 -.24 .02 -.13 .15 -.02 .01 .28 .00 -.06 -.11 .20|-.05 .32\*-.09 .02 -.31 .16 -.10 -.27 -.13 .25

[B] Entire series, effect on correlation ( .432) is:

Lower 1938< -.121 1937< -.026 1948> -.019 1939> -.015 1969< -.014 2010> -.013 Higher 2003 .090 1957 .018

1936 to 1965 segment:

Lower 1938< -.217 1937< -.037 1948> -.028 1939> -.027 1962> -.013 1944> -.007 Higher 1957 .059 1945 .050

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

1938 1939 4.6 SD

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

1982 -1.316 12 1

1984 -1.159 12 1

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

1938 -5.3 SD

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899A 1946 to 2010 65 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

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

1965 1994 0 -.13 -.04 -.05 .21 .12 -.18 .20 .30 .15 .04 .32\* .20 -.23 -.08 -.23 -.21 -.35 -.26 -.21 -.04 .11

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

Lower 1996< -.125 1953> -.040 1990< -.021 1966> -.017 1978> -.012 1965> -.009 Higher 2003 .148 1957 .025

1965 to 1994 segment:

Lower 1990< -.088 1966> -.041 1978> -.037 1965> -.035 1986> -.027 1972< -.022 Higher 1976 .138 1981 .072

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

1996 -5.9 SD

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899B 1934 to 2010 77 years Series 12

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

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

1934 1963 0 -.04 .17 -.21 .24 -.13 .16 -.26 .20 -.31 -.01 .31\*-.41 -.08 -.05 -.14 -.15 .00 .22 -.24 .17 .05

1935 1964 0 -.06 .13 -.22 .24 -.12 .19 -.31 .22 -.35 .03 .40\*-.44 -.13 -.03 -.15 -.12 .02 .23 -.21 .15 .07

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

1965 1994 -1 -.44 -.26 .09 .04 -.05 .01 .32 .10 .22 .54\* .39|-.04 .02 -.06 -.20 -.30 -.34 -.28 -.24 -.14 -.14

[B] Entire series, effect on correlation ( .293) is:

Lower 1934> -.056 1952> -.020 1945< -.019 1956< -.019 1949< -.019 1939> -.011 Higher 1953 .111 1948 .020

1934 to 1963 segment:

Lower 1934> -.106 1945< -.035 1952> -.034 1949< -.031 1956< -.027 1939> -.023 Higher 1953 .290 1954 .025

1935 to 1964 segment:

Lower 1952> -.043 1945< -.043 1949< -.033 1939> -.031 1956< -.029 1942> -.014 Higher 1953 .254 1954 .020

1965 to 1994 segment:

Lower 1967< -.057 1965> -.044 1989< -.035 1978> -.028 1990< -.026 1974< -.024 Higher 1976 .106 1982 .043

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

1952 1953 -4.2 SD

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

1934 +5.2 SD; 1953 -9.7 SD

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PART 7: DESCRIPTIVE STATISTICS: 14:56 Wed 06 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 141A 1918 2010 93 7 3 .516 1.27 6.23 1.035 .863 .300 2.49 .422 -.083 1

2 141B 1927 2010 84 6 0 .606 1.55 4.76 .704 .757 .247 2.64 .539 .006 1

3 142A 1926 2010 85 6 0 .679 .90 3.80 .756 .794 .349 2.59 .401 .060 2

4 142B 1926 2010 85 6 0 .625 .80 3.36 .569 .632 .418 2.69 .455 -.045 1

5 143A 1924 2010 87 6 2 .586 1.67 3.60 .749 .776 .250 2.79 .586 -.032 2

6 143B 1922 2010 89 6 1 .569 1.80 3.45 .699 .656 .260 2.69 .515 .012 1

7 144A 1906 2010 105 7 0 .597 1.01 2.70 .580 .755 .281 2.60 .365 -.010 1

8 144B 1919 2010 92 7 1 .644 1.07 3.78 .680 .862 .215 2.70 .463 -.001 1

9 145A 1931 2010 80 6 0 .703 1.60 4.42 1.344 .919 .314 2.39 .334 -.081 1

10 145B 1936 2010 75 5 1 .432 1.30 4.05 .931 .871 .379 2.61 .457 .053 4

11 899A 1946 2010 65 5 1 .503 1.15 3.27 .711 .816 .258 2.66 .452 -.067 1

12 899B 1934 2010 77 6 3 .293 1.37 3.33 .856 .795 .300 2.35 .277 -.103 1

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Total or mean: 1017 73 12 .567 1.29 6.23 .795 .789 .296 2.79 .439 -.023

- = [ COFECHA 171 COF ] = -