[] Dendrochronology Program Library Run USPMI Program COF 15:22 Mon 09 Dec 2013 Page 1

[]

[] P R O G R A M C O F E C H A Version 6.06P 28834

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

QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: USPMid\_BEAL\_2

File of DATED series: USPMid\_BEAL\_2

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 1851 to 2012 162 years

Continuous time span is 1851 to 2012 162 years

Portion with two or more series is 1865 to 2012 148 years

>> 652B 1999 absent in 1 of 22 series, but is not usually narrow: master index is .067

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

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

\*O\* Master series 1851 2012 162 yrs \*O\*

\*F\* Total rings in all series 2044 \*F\*

\*E\* Total dated rings checked 2030 \*E\*

\*C\* Series intercorrelation .445 \*C\*

\*H\* Average mean sensitivity .298 \*H\*

\*A\* Segments, possible problems 15 \*A\*

\*\*\* Mean length of series 92.9 \*\*\*

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

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

652A 1 absent rings: 2001

652B 3 absent rings: 1999 2000 2001

4 absent rings .196%

PART 2: TIME PLOT OF TREE-RING SERIES: USPMid\_BEAL\_2 15:22 Mon 09 Dec 2013 Page 2

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

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

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

. . . . . . . . . . . . . . . . <===============> . 639A 1 1851 2012 162

. . . . . . . . . . . . . . . . .<==============> . 639B 2 1865 2012 148

. . . . . . . . . . . . . . . . . . <=======> . 644A 3 1938 2012 75

. . . . . . . . . . . . . . . . . . <======> . 644B 4 1941 2012 72

. . . . . . . . . . . . . . . . . . <======> . 645A 5 1947 2012 66

. . . . . . . . . . . . . . . . . . <=====> . 645B 6 1954 2012 59

. . . . . . . . . . . . . . . . . . <=====> . 648A 7 1956 2012 57

. . . . . . . . . . . . . . . . . . <======> . 651A 8 1940 2012 73

. . . . . . . . . . . . . . . . . <==========> . 651B 9 1905 2012 108

. . . . . . . . . . . . . . . . . <==========> . 652A 10 1905 2012 108

. . . . . . . . . . . . . . . . . .<=========> . 652B 11 1919 2012 94

. . . . . . . . . . . . . . . . . . <======> . 659A 12 1943 2012 70

. . . . . . . . . . . . . . . . . . <=======> . 659B 13 1934 2012 79

. . . . . . . . . . . . . . . . . . <=====> . 661A 14 1957 2012 56

. . . . . . . . . . . . . . . . . . <======> . 661B 15 1944 2012 69

. . . . . . . . . . . . . . . . . . <=====> . 664A 16 1952 2012 61

. . . . . . . . . . . . . . . . . <==========> . 664B 17 1901 2012 112

. . . . . . . . . . . . . . . . . <============> . 663A 18 1884 2012 129

. . . . . . . . . . . . . . . . . <===========> . 663B 19 1895 2012 118

. . . . . . . . . . . . . . . . . <===========> . 665A 20 1891 2012 122

. . . . . . . . . . . . . . . . . <===========> . 665B 21 1899 2012 114

. . . . . . . . . . . . . . . . . . <========> . 666A 22 1921 2012 92

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

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: USPMid\_BEAL\_2 15:22 Mon 09 Dec 2013 Page 3

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

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

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

1900 -.092 6 1950 -.099 18 2000 -.539 22 1

1851 -.198 1 1901 .319 7 1951 .781 18 2001 -1.393 22 2

1852 .261 1 1902 -.484 7 1952 .892 19 2002 .141 22

1853 .278 1 1903 -.134 7 1953 .437 19 2003 .270 22

1854 .655 1 1904 -.272 7 1954 .172 20 2004 .696 22

1855 -5.075 1 1905 -1.317 9 1955 1.546 20 2005 .700 22

1856 1.815 1 1906 .726 9 1956 .926 21 2006 -.224 22

1857 .557 1 1907 -1.132 9 1957 -.472 22 2007 .933 22

1858 -.263 1 1908 .016 9 1958 -.095 22 2008 .383 22

1859 .237 1 1909 -.256 9 1959 -.247 22 2009 .172 22

1860 -.203 1 1910 .202 9 1960 -.033 22 2010 .357 22

1861 .098 1 1911 .714 9 1961 .567 22 2011 -.898 22

1862 -5.368 1 1912 -.211 9 1962 .214 22 2012 .303 22

1863 -1.535 1 1913 -.613 9 1963 .370 22

1864 .681 1 1914 .366 9 1964 -.752 22

1865 2.167 2 1915 .116 9 1965 -.562 22

1866 .565 2 1916 .335 9 1966 -.320 22

1867 .845 2 1917 .768 9 1967 -.738 22

1868 -.032 2 1918 1.712 9 1968 -.776 22

1869 1.487 2 1919 .468 10 1969 .604 22

1870 -.277 2 1920 .581 10 1970 .856 22

1871 -.470 2 1921 .660 11 1971 .520 22

1872 1.140 2 1922 .686 11 1972 -.017 22

1873 .913 2 1923 .310 11 1973 1.083 22

1874 -.298 2 1924 .135 11 1974 .199 22

1875 .818 2 1925 -.564 11 1975 -.029 22

1876 .495 2 1926 -1.225 11 1976 -1.144 22

1877 -.003 2 1927 -.303 11 1977 -.822 22

1878 -2.144 2 1928 .442 11 1978 .100 22

1879 -1.285 2 1929 -.260 11 1979 .269 22

1880 -.142 2 1930 .187 11 1980 -.152 22

1881 -2.112 2 1931 .487 11 1981 -1.116 22

1882 -1.757 2 1932 -.271 11 1982 .611 22

1883 -.841 2 1933 -.153 11 1983 .809 22

1884 -3.444 3 1934 -.110 12 1984 .024 22

1885 .052 3 1935 .340 12 1985 .081 22

1886 -.542 3 1936 -1.779 12 1986 -.981 22

1887 .550 3 1937 -.751 12 1987 .278 22

1888 .520 3 1938 -.216 13 1988 1.102 22

1889 1.021 3 1939 .783 13 1989 .739 22

1890 1.129 3 1940 .334 14 1990 .635 22

1891 .967 4 1941 .450 15 1991 .244 22

1892 .310 4 1942 .441 15 1992 -.394 22

1893 .780 4 1943 .670 16 1993 -1.012 22

1894 1.129 4 1944 -.062 17 1994 -.013 22

1895 .778 5 1945 -.968 17 1995 1.318 22

1896 .763 5 1946 -1.773 17 1996 .272 22

1897 -.813 5 1947 .699 18 1997 -.621 22

1898 1.046 5 1948 -1.516 18 1998 -.829 22

1899 .798 6 1949 .070 18 1999 .067 22 1<<

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

PART 4: Master Bar Plot: USPMid\_BEAL\_2 15:22 Mon 09 Dec 2013 Page 4

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

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----@ 2000--b

1851---a 1901------A 1951---------C 2001f

1852------A 1902--b 1952---------D 2002-----A

1853------A 1903---a 1953-------B 2003------A

1854--------C 1904---a 1954-----A 2004--------C

1855t 1905e 1955----------F 2005--------C

1856----------G 1906--------C 1956---------D 2006---a

1857-------B 1907-e 1957--b 2007---------D

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

1859-----A 1909---a 1959---a 2009-----A

1860---a 1910-----A 1960----@ 2010------A

1861-----@ 1911--------C 1961-------B 2011-d

1862u 1912---a 1962-----A 2012------A

1863f 1913--b 1963------A

1864--------C 1914------A 1964-c

1865----------I 1915-----@ 1965--b

1866-------B 1916------A 1966---a

1867---------C 1917---------C 1967-c

1868----@ 1918----------G 1968-c

1869----------F 1919-------B 1969--------B

1870---a 1920-------B 1970---------C

1871--b 1921--------C 1971-------B

1872----------E 1922--------C 1972----@

1873---------D 1923------A 1973----------D

1874---a 1924-----A 1974-----A

1875---------C 1925--b 1975----@

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

1877----@ 1927---a 1977-c

1878i 1928-------B 1978-----@

1879-e 1929---a 1979------A

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

1881h 1931-------B 1981-d

1882g 1932---a 1982--------B

1883-c 1933---a 1983---------C

1884n 1934----@ 1984----@

1885----@ 1935------A 1985-----@

1886--b 1936g 1986-d

1887-------B 1937-c 1987------A

1888-------B 1938---a 1988----------D

1889----------D 1939---------C 1989--------C

1890----------E 1940------A 1990--------C

1891---------D 1941-------B 1991------A

1892------A 1942-------B 1992--b

1893---------C 1943--------C 1993-d

1894----------E 1944----@ 1994----@

1895---------C 1945-d 1995----------E

1896---------C 1946g 1996------A

1897-c 1947--------C 1997--b

1898----------D 1948f 1998-c

1899---------C 1949----@ 1999----@

PART 5: CORRELATION OF SERIES BY SEGMENTS: USPMid\_BEAL\_2 15:22 Mon 09 Dec 2013 Page 5

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

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 1850 1875 1900 1925 1950 1975

1899 1924 1949 1974 1999 2024

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

1 639A 1851 2012 .56 .55 .54 .42 .45 .43

2 639B 1865 2012 .49 .49 .54 .57 .54 .63

3 644A 1938 2012 .63 .44 .40

4 644B 1941 2012 .67 .44 .42

5 645A 1947 2012 .62 .52 .45

6 645B 1954 2012 .55 .40

7 648A 1956 2012 .54 .54

8 651A 1940 2012 .40 .41 .51

9 651B 1905 2012 .42 .26A .24A .26B

10 652A 1905 2012 .25A .29A .44 .42

11 652B 1919 2012 .45 .48 .33 .45

12 659A 1943 2012 .67 .54 .52

13 659B 1934 2012 .58 .47 .34

14 661A 1957 2012 .33 .44

15 661B 1944 2012 .62 .50 .39

16 664A 1952 2012 .39 .30A

17 664B 1901 2012 .39 .35B .38 .38

18 663A 1884 2012 .24B .40 .41 .23B .28A

19 663B 1895 2012 .49 .44 .44 .31A .31A

20 665A 1891 2012 .29B .25B .26B .34 .42

21 665B 1899 2012 .47 .47 .56 .48 .62

22 666A 1921 2012 .62 .65 .53 .44

Av segment correlation .52 .42 .43 .50 .43 .42

PART 6: POTENTIAL PROBLEMS: USPMid\_BEAL\_2 15:22 Mon 09 Dec 2013 Page 5

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

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

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

639A 1851 to 2012 162 years Series 1

[\*] Early part of series cannot be checked from 1851 to 1864 -- not matched by another series

[B] Entire series, effect on correlation ( .460) is:

Lower 1878> -.035 2009< -.020 1873< -.013 1906< -.012 1967> -.011 1976> -.010 Higher 1884 .026 1865 .016

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

2009 -5.2 SD

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

639B 1865 to 2012 148 years Series 2

[B] Entire series, effect on correlation ( .548) is:

Lower 1886> -.019 1878< -.014 1873> -.013 1900> -.011 1935< -.010 1976> -.009 Higher 1948 .037 1884 .023

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

644A 1938 to 2012 75 years Series 3

[B] Entire series, effect on correlation ( .518) is:

Lower 1973< -.033 2003< -.032 2011> -.015 1998> -.014 1980> -.014 1997> -.013 Higher 1948 .076 2001 .019

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

644B 1941 to 2012 72 years Series 4

[B] Entire series, effect on correlation ( .554) is:

Lower 1996< -.045 2005< -.032 2001> -.021 1974> -.013 1976> -.012 1957> -.011 Higher 1948 .090 1955 .022

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

645A 1947 to 2012 66 years Series 5

[B] Entire series, effect on correlation ( .511) is:

Lower 1993> -.030 2001> -.027 2006> -.025 2010< -.020 2007< -.013 1947< -.012 Higher 1948 .095 1976 .030

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

645B 1954 to 2012 59 years Series 6

[B] Entire series, effect on correlation ( .418) is:

Lower 2012< -.082 2006> -.034 2011> -.025 2003< -.014 1977> -.009 1983< -.009 Higher 2001 .050 1973 .025

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

648A 1956 to 2012 57 years Series 7

[B] Entire series, effect on correlation ( .554) is:

Lower 1980< -.043 2001> -.022 1974> -.016 1989< -.016 1996> -.015 2012< -.014 Higher 1981 .026 1957 .017

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

651A 1940 to 2012 73 years Series 8

[B] Entire series, effect on correlation ( .424) is:

Lower 1959< -.063 1948> -.029 1964> -.017 1996> -.016 1999< -.012 2004< -.009 Higher 1976 .023 1947 .018

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

1959 -4.9 SD

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

651B 1905 to 2012 108 years Series 9

[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 1974 0 .13 .04 .07 -.20 .12 -.14 -.03 -.10 .05 -.19 .26\*-.02 .10 -.10 .21 -.01 .01 -.05 .02 -.12 .01

1950 1999 0 .04 -.21 .04 -.11 .02 .13 .05 -.06 .05 .04 .24\*-.14 -.18 -.16 -.16 .08 .16 .23 -.16 -.08 .11

1963 2012 -5 .01 -.21 .04 -.08 .03 .30\* .05 .24 -.12 .13 .26| - - - - - - - - - -

[B] Entire series, effect on correlation ( .374) is:

Lower 1970< -.028 1932< -.027 1964> -.017 1982< -.013 1969< -.012 1926> -.012 Higher 2001 .023 1907 .020

1925 to 1974 segment:

Lower 1970< -.047 1932< -.036 1964> -.031 1926> -.022 1969< -.019 1971< -.016 Higher 1955 .039 1948 .038

1950 to 1999 segment:

Lower 1970< -.081 1964> -.047 1982< -.038 1969< -.034 1971< -.027 1966> -.022 Higher 1981 .070 1995 .059

1963 to 2012 segment:

Lower 1970< -.075 1964> -.041 1982< -.036 1969< -.032 1971< -.027 1976> -.017 Higher 2001 .081 1981 .055

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

652A 1905 to 2012 108 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

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

1905 1954 0 .18 -.12 -.03 -.23 -.02 -.08 -.07 -.13 .10 -.10 .25\*-.12 .13 .11 .17 -.16 .07 .24 -.10 -.02 -.11

1925 1974 0 .19 -.02 .08 -.15 .02 -.05 -.15 .01 .06 -.11 .29\*-.08 .04 .03 .09 -.21 -.06 .16 -.15 .08 -.05

[B] Entire series, effect on correlation ( .346) is:

Lower 1929< -.044 1936> -.042 1988< -.025 1921< -.014 1953< -.014 2004< -.013 Higher 2001 .022 1946 .019

1905 to 1954 segment:

Lower 1929< -.073 1936> -.066 1921< -.023 1953< -.022 1939< -.016 1942< -.014 Higher 1946 .039 1907 .032

1925 to 1974 segment:

Lower 1929< -.084 1936> -.078 1953< -.026 1939< -.019 1942< -.016 1940> -.009 Higher 1946 .040 1955 .030

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

2001 -1.393 22 2

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

1929 -5.8 SD; 1936 +3.1 SD

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

652B 1919 to 2012 94 years Series 11

[B] Entire series, effect on correlation ( .454) is:

Lower 1953< -.046 1988< -.015 1976> -.015 1957> -.014 1922< -.012 1926> -.011 Higher 1936 .073 1995 .019

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

1999 .067 22 1 >> WARNING: Ring is not usually narrow

2000 -.539 22 1

2001 -1.393 22 2

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

1953 -4.6 SD

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

659A 1943 to 2012 70 years Series 12

[B] Entire series, effect on correlation ( .637) is:

Lower 1989< -.022 1964> -.016 1996< -.013 2006> -.012 1974> -.012 2001> -.011 Higher 1948 .065 1946 .016

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

659B 1934 to 2012 79 years Series 13

[B] Entire series, effect on correlation ( .429) is:

Lower 1934< -.076 1990< -.039 2011> -.025 2003< -.021 1997> -.016 1996> -.013 Higher 1948 .064 1976 .014

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

661A 1957 to 2012 56 years Series 14

[B] Entire series, effect on correlation ( .363) is:

Lower 1957> -.058 1986> -.032 1966< -.029 1981> -.023 1989< -.018 2000> -.017 Higher 1964 .030 1997 .023

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

661B 1944 to 2012 69 years Series 15

[B] Entire series, effect on correlation ( .521) is:

Lower 2006< -.033 2000> -.024 1949< -.019 2009< -.019 1967> -.018 1997> -.013 Higher 1948 .099 1976 .020

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

664A 1952 to 2012 61 years Series 16

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

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

1963 2012 0 .15 .04 .02 .00 -.01 .16 -.04 -.37 -.16 -.20 .30\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .350) is:

Lower 2007< -.040 2001> -.029 1980> -.027 1969< -.016 1959> -.016 2000> -.014 Higher 1976 .058 1955 .038

1963 to 2012 segment:

Lower 2007< -.055 1980> -.033 2001> -.031 1969< -.021 2000> -.016 2005< -.014 Higher 1976 .083 1986 .039

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

1980 +3.3 SD

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

664B 1901 to 2012 112 years Series 17

[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 1974 -9 -.15 .38\*-.06 -.20 -.19 -.17 -.13 -.02 -.16 .08 .35| .07 .00 .02 .02 -.16 -.15 .12 -.02 -.02 .08

[B] Entire series, effect on correlation ( .395) is:

Lower 1936> -.032 1964> -.020 1910< -.018 1957< -.014 1983< -.013 1909> -.013 Higher 1905 .015 1926 .011

1925 to 1974 segment:

Lower 1936> -.065 1964> -.038 1957< -.029 1948> -.021 1940> -.017 1974> -.009 Higher 1955 .026 1926 .023

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

1957 -4.9 SD

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

663A 1884 to 2012 129 years Series 18

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

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

1884 1933 -2 -.07 -.33 .17 -.11 -.10 .02 -.03 .22 .26\*-.11 .24|-.23 .24 .00 -.10 .02 .05 .08 -.24 .02 .11

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

1950 1999 10 -.10 .08 -.23 -.13 .06 .01 .22 -.18 -.03 .16 .23| .00 -.05 .16 -.05 -.19 -.11 -.03 .10 -.03 .23\*

1963 2012 0 .08 .12 -.20 -.09 -.05 .18 .11 -.29 -.07 .13 .28\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .302) is:

Lower 1990< -.060 1910< -.012 1884> -.009 1909< -.009 1996> -.009 1895< -.008 Higher 1936 .053 1918 .017

1884 to 1933 segment:

Lower 1910< -.030 1909< -.023 1895< -.020 1892> -.019 1900< -.016 1898< -.014 Higher 1918 .045 1905 .026

1950 to 1999 segment:

Lower 1990< -.178 1996> -.026 1986> -.017 1999< -.016 1957> -.016 1980> -.013 Higher 1981 .063 1997 .033

1963 to 2012 segment:

Lower 1990< -.174 1996> -.024 1986> -.019 1999< -.017 2000> -.015 1980> -.011 Higher 2011 .049 1981 .049

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

1884 1885 -4.2 SD

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

1884 +4.2 SD; 1910 -4.5 SD

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

663B 1895 to 2012 118 years Series 19

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

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

1950 1999 0 .04 .00 -.18 -.05 -.05 .09 -.16 -.16 -.08 .19 .31\* .30 .10 -.05 .20 -.24 -.18 .00 -.10 .05 .06

1963 2012 0 .17 .10 -.07 -.05 -.10 .07 -.11 -.24 -.11 .10 .31\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .413) is:

Lower 1948> -.035 1986> -.018 1982< -.018 1928< -.017 1925> -.014 1970< -.012 Higher 1936 .067 1918 .015

1950 to 1999 segment:

Lower 1986> -.053 1982< -.051 1970< -.036 1981> -.030 1957> -.025 1990< -.016 Higher 1964 .037 1988 .033

1963 to 2012 segment:

Lower 1986> -.051 1982< -.048 1970< -.034 1981> -.030 2002< -.025 2010< -.016 Higher 1988 .035 1964 .030

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

665A 1891 to 2012 122 years Series 20

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

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

1891 1940 10 .02 -.06 -.02 .01 -.01 -.09 -.03 -.20 .10 .05 .29|-.05 -.03 .15 -.09 -.18 -.12 -.07 .09 -.29 .46\*

1900 1949 10 .11 .07 -.16 .17 -.10 -.07 -.15 -.18 .02 .09 .25| .00 .08 .14 -.09 -.17 -.14 -.01 -.07 -.24 .35\*

1925 1974 10 .24 .05 -.05 .13 -.13 -.31 -.18 -.24 .10 .14 .26| .01 .07 .22 -.12 -.14 -.09 .05 -.09 -.19 .38\*

[B] Entire series, effect on correlation ( .322) is:

Lower 1943< -.016 1980> -.013 1925> -.012 1947< -.011 1932> -.011 1940> -.010 Higher 1976 .016 1946 .014

1891 to 1940 segment:

Lower 1925> -.025 1932> -.023 1940> -.022 1894< -.021 1929> -.019 1914< -.018 Higher 1926 .036 1936 .031

1900 to 1949 segment:

Lower 1943< -.032 1925> -.023 1932> -.021 1947< -.020 1940> -.018 1929> -.017 Higher 1946 .028 1936 .027

1925 to 1974 segment:

Lower 1943< -.034 1947< -.024 1925> -.023 1932> -.021 1974< -.021 1957> -.019 Higher 1926 .032 1946 .030

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

1963 +3.2 SD

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

665B 1899 to 2012 114 years Series 21

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

Lower 1905> -.022 1921< -.018 1920< -.014 1986> -.013 1939< -.011 1965> -.010 Higher 1948 .057 1936 .017

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

666A 1921 to 2012 92 years Series 22

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

Lower 2012< -.019 1983< -.017 2011> -.016 1931< -.015 2002< -.011 1963< -.010 Higher 1936 .064 1946 .016

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

PART 7: DESCRIPTIVE STATISTICS: USPMid\_BEAL\_2 15:22 Mon 09 Dec 2013 Page 6

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

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 639A 1851 2012 162 6 0 .460 1.13 3.25 .766 .796 .348 2.65 .378 -.055 1

2 639B 1865 2012 148 6 0 .548 1.23 4.43 .896 .774 .414 2.74 .460 -.014 1

3 644A 1938 2012 75 3 0 .518 3.35 6.70 1.234 .781 .203 2.69 .432 -.010 1

4 644B 1941 2012 72 3 0 .554 2.49 7.74 1.384 .678 .313 2.73 .520 -.029 1

5 645A 1947 2012 66 3 0 .511 1.51 3.59 .826 .876 .264 2.50 .451 .051 1

6 645B 1954 2012 59 2 0 .418 3.13 5.13 .725 .516 .184 2.64 .553 .142 2

7 648A 1956 2012 57 2 0 .554 2.17 4.35 .753 .698 .206 2.70 .528 .049 1

8 651A 1940 2012 73 3 0 .424 2.57 5.20 1.300 .847 .258 2.56 .443 .075 1

9 651B 1905 2012 108 4 3 .374 1.34 4.83 1.055 .858 .273 2.72 .467 .023 1

10 652A 1905 2012 108 4 2 .346 1.79 4.11 1.053 .817 .379 2.66 .426 -.034 1

11 652B 1919 2012 94 4 0 .454 1.32 3.74 1.027 .833 .457 2.71 .492 .004 1

12 659A 1943 2012 70 3 0 .637 2.05 5.09 1.163 .817 .234 2.81 .580 -.057 1

13 659B 1934 2012 79 3 0 .429 2.09 4.89 1.066 .726 .255 2.57 .469 -.077 1

14 661A 1957 2012 56 2 0 .363 2.51 9.19 1.565 .882 .219 2.56 .524 -.085 1

15 661B 1944 2012 69 3 0 .521 1.79 3.66 .831 .735 .306 2.48 .501 -.032 1

16 664A 1952 2012 61 2 1 .350 2.89 5.75 .933 .669 .200 2.62 .463 -.062 2

17 664B 1901 2012 112 4 1 .395 1.40 3.40 .779 .796 .304 2.53 .372 -.020 1

18 663A 1884 2012 129 5 3 .302 1.63 5.22 .874 .823 .256 2.57 .401 -.045 1

19 663B 1895 2012 118 5 2 .413 1.26 3.22 .644 .743 .294 2.62 .359 -.008 1

20 665A 1891 2012 122 5 3 .322 1.75 4.48 .990 .795 .291 2.78 .407 -.027 1

21 665B 1899 2012 114 5 0 .500 1.88 4.86 1.072 .832 .289 2.55 .373 -.040 2

22 666A 1921 2012 92 4 0 .540 1.78 5.31 1.021 .775 .311 2.78 .462 -.005 2

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

Total or mean: 2044 81 15 .445 1.81 9.19 .973 .784 .298 2.81 .444 -.016

- = [ COFECHA USPMICOF ] = -