[] Dendrochronology Program Library Run FIN1 Program COF 16:36 Mon 08 Jul 2013 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 28680

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: Final

File of DATED series: USPLow\_ACRU\_Final

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 1941 to 2012 72 years

Continuous time span is 1941 to 2012 72 years

Portion with two or more series is 1943 to 2012 70 years

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

\*C\* Number of dated series 14 \*C\*

\*O\* Master series 1941 2012 72 yrs \*O\*

\*F\* Total rings in all series 877 \*F\*

\*E\* Total dated rings checked 875 \*E\*

\*C\* Series intercorrelation .606 \*C\*

\*H\* Average mean sensitivity .228 \*H\*

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

\*\*\* Mean length of series 62.6 \*\*\*

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

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

609A 2 absent rings: 1972 1980

2 absent rings .228%

PART 2: TIME PLOT OF TREE-RING SERIES: Final 16:36 Mon 08 Jul 2013 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

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

. . . . . . . . . . . . . . . . . . <======> . 608A 1 1945 2012 68

. . . . . . . . . . . . . . . . . . <======> . 609A 2 1944 2012 69

. . . . . . . . . . . . . . . . . . . <===> . 613A 3 1970 2012 43

. . . . . . . . . . . . . . . . . . <======> . 613B 4 1941 2012 72

. . . . . . . . . . . . . . . . . . <=====> . 629A 5 1955 2012 58

. . . . . . . . . . . . . . . . . . <=====> . 629B 6 1956 2012 57

. . . . . . . . . . . . . . . . . . <=====> . 631A 7 1954 2012 59

. . . . . . . . . . . . . . . . . . <=====> . 631B 8 1954 2012 59

. . . . . . . . . . . . . . . . . . <======> . 632A 9 1943 2012 70

. . . . . . . . . . . . . . . . . . <=====> . 632B 10 1953 2012 60

. . . . . . . . . . . . . . . . . . <=====> . 634A 11 1951 2012 62

. . . . . . . . . . . . . . . . . . <======> . 634B 12 1943 2012 70

. . . . . . . . . . . . . . . . . . <=====> . 635A 13 1950 2012 63

. . . . . . . . . . . . . . . . . . <======> . 635B 14 1946 2012 67

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

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 16:36 Mon 08 Jul 2013 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 .938 7 2000 -1.331 14

1951 .760 8 2001 -2.243 14

1952 .946 8 2002 -.456 14

1953 .521 9 2003 -.340 14

1954 -1.033 11 2004 -.924 14

1955 1.016 12 2005 .027 14

1956 .050 13 2006 .838 14

1957 -.052 13 2007 .433 14

1958 -.254 13 2008 .182 14

1959 .307 13 2009 -.944 14

1960 -4.499 13 2010 -.134 14

1961 -.326 13 2011 .500 14

1962 -.573 13 2012 1.408 14

1963 .797 13

1964 .462 13

1965 .876 13

1966 -.994 13

1967 -.556 13

1968 -.755 13

1969 .950 13

1970 .361 14

1971 .075 14

1972 -1.232 14 1

1973 1.113 14

1974 .263 14

1975 1.063 14

1976 -.199 14

1977 .782 14

1978 1.427 14

1979 .458 14

1980 -.411 14 1

1981 -.614 14

1982 -.944 14

1983 .340 14

1984 -.046 14

1985 -1.644 14

1986 -1.124 14

1987 -.141 14

1988 1.849 14

1989 .066 14

1990 .997 14

1941 2.149 1 1991 .813 14

1942 -.350 1 1992 -.909 14

1943 1.142 3 1993 -.258 14

1944 -.581 4 1994 .522 14

1945 -.180 5 1995 1.035 14

1946 -.976 6 1996 -.542 14

1947 -.470 6 1997 -.536 14

1948 -.821 6 1998 .571 14

1949 .871 6 1999 .482 14

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PART 4: Master Bar Plot: Final 16:36 Mon 08 Jul 2013 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---------D 2000e

1951--------C 2001i

1952---------D 2002---b

1953-------B 2003---a

1954-d 2004-d

1955---------D 2005-----@

1956-----@ 2006--------C

1957-----@ 2007------B

1958----a 2008-----A

1959------A 2009-d

1960r 2010----a

1961---a 2011-------B

1962--b 2012----------F

1963--------C

1964-------B

1965--------D

1966-d

1967--b

1968--c

1969---------D

1970------A

1971-----@

1972e

1973---------D

1974------A

1975---------D

1976----a

1977--------C

1978----------F

1979-------B

1980---b

1981--b

1982-d

1983------A

1984-----@

1985g

1986-d

1987----a

1988----------G

1989-----@

1990---------D

1941----------I 1991--------C

1942---a 1992-d

1943---------E 1993----a

1944--b 1994-------B

1945----a 1995---------D

1946-d 1996--b

1947---b 1997--b

1948-c 1998-------B

1949--------C 1999-------B

PART 5: CORRELATION OF SERIES BY SEGMENTS: Final 16:36 Mon 08 Jul 2013 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 1935 1950 1965 1980 1995

1964 1979 1994 2009 2024

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

1 608A 1945 2012 .65 .70 .35B .40A .61

2 609A 1944 2012 .71 .76 .38A .41B .37B

3 613A 1970 2012 .38B .58 .61

4 613B 1941 2012 .69 .77 .48 .58 .62

5 629A 1955 2012 .59 .38B .52 .57

6 629B 1956 2012 .63 .46B .33B .35B

7 631A 1954 2012 .47 .52 .51 .60

8 631B 1954 2012 .60 .54 .60 .68

9 632A 1943 2012 .70 .83 .51 .43 .52

10 632B 1953 2012 .88 .58 .47 .52

11 634A 1951 2012 .79 .58 .65 .66

12 634B 1943 2012 .88 .86 .77 .69 .69

13 635A 1950 2012 .76 .81 .37B .38B

14 635B 1946 2012 .49 .49 .56 .50 .59

Av segment correlation .69 .70 .52 .50 .55

PART 6: POTENTIAL PROBLEMS: Final 16:36 Mon 08 Jul 2013 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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608A 1945 to 2012 68 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

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

1965 1994 5 .06 -.17 .08 -.23 -.03 -.25 .08 -.31 -.32 .00 .35|-.01 .05 -.10 .30 .42\* .00 -.01 -.09 .04 -.21

1980 2009 0 -.14 -.01 .15 -.11 -.16 -.26 -.04 -.19 -.22 .10 .40\* .05 -.03 .03 - - - - - - -

[B] Entire series, effect on correlation ( .498) is:

Lower 1980< -.111 1947> -.024 1955< -.019 2003< -.015 1966> -.011 1957< -.010 Higher 1960 .149 2001 .035

1965 to 1994 segment:

Lower 1980< -.266 1966> -.030 1977< -.026 1968> -.012 1978< -.009 1974> -.008 Higher 1988 .037 1972 .036

1980 to 2009 segment:

Lower 1980< -.212 2000> -.035 2003< -.024 1998< -.020 1985> -.020 1996> -.013 Higher 2001 .094 1988 .041

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

1980 -5.4 SD

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

609A 1944 to 2012 69 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

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

1965 1994 0 .34 -.10 .10 -.02 .26 -.18 -.06 -.20 -.17 -.13 .38\*-.02 .06 -.29 .37 .08 -.11 -.39 .05 .01 .07

1980 2009 -7 .19 -.14 -.01 .51\*-.03 -.20 -.17 .01 -.39 -.26 .41| .15 .01 -.23 - - - - - - -

1983 2012 -7 .14 -.26 .09 .56\* .02 -.22 -.08 .14 -.38 -.34 .37| - - - - - - - - - -

[B] Entire series, effect on correlation ( .558) is:

Lower 1946< -.035 2001> -.022 1985> -.020 1980< -.015 2007< -.012 1986> -.012 Higher 1960 .191 1988 .015

1965 to 1994 segment:

Lower 1985> -.079 1986> -.041 1976> -.030 1975< -.018 1984> -.018 1978< -.015 Higher 1972 .070 1988 .055

1980 to 2009 segment:

Lower 2001> -.046 1985> -.046 2007< -.040 1980< -.035 1986> -.027 1999< -.024 Higher 1988 .078 1992 .028

1983 to 2012 segment:

Lower 2007< -.059 2012< -.043 1985> -.036 1999< -.034 1986> -.033 1990< -.024 Higher 1988 .087 2000 .045

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

1972 -1.232 14 1

1980 -.411 14 1

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

613A 1970 to 2012 43 years Series 3

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

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

1970 1999 -4 .36 -.05 .17 -.30 -.16 -.17 .39\*-.07 -.12 -.03 .38|-.01 -.10 -.12 .01 .10 -.04 -.13 -.22 -.21 -.26

[B] Entire series, effect on correlation ( .572) is:

Lower 1985> -.053 1995< -.037 1970< -.026 1980< -.017 1992> -.017 2011< -.015 Higher 2001 .059 2000 .045

1970 to 1999 segment:

Lower 1995< -.061 1985> -.060 1970< -.042 1973< -.017 1992> -.015 1976> -.012 Higher 1988 .036 1972 .035

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613B 1941 to 2012 72 years Series 4

[\*] Early part of series cannot be checked from 1941 to 1942 -- not matched by another series

[B] Entire series, effect on correlation ( .668) is:

Lower 1956< -.030 1943< -.019 1985> -.018 1996> -.015 1972> -.013 1964< -.011 Higher 1960 .143 2001 .010

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629A 1955 to 2012 58 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

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

1965 1994 -2 .14 -.31 .35 -.31 -.02 -.19 -.10 -.15 .39\*-.02 .38|-.19 .02 -.06 .20 -.03 -.10 -.09 -.18 .06 .04

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

Lower 1971< -.025 1989> -.018 1994< -.018 1982< -.016 1966> -.014 1995< -.012 Higher 2001 .038 1960 .037

1965 to 1994 segment:

Lower 1989> -.045 1971< -.039 1966> -.038 1994< -.037 1981> -.025 1967> -.021 Higher 1990 .030 1973 .029

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629B 1956 to 2012 57 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

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

1965 1994 -6 .09 -.18 .40 -.20 .49\*-.21 .09 -.28 .15 -.09 .46|-.06 .01 -.16 .08 -.10 .11 -.12 .20 -.09 .07

1980 2009 -8 -.09 -.16 .36\* .02 -.16 -.29 -.06 -.08 -.16 -.11 .33| .35 -.14 -.01 - - - - - - -

1983 2012 -8 -.08 -.06 .38\* .04 -.16 -.31 -.04 -.14 -.22 -.09 .35| - - - - - - - - - -

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

Lower 2001> -.078 1966< -.016 1956> -.015 1993< -.014 1980> -.013 1984< -.009 Higher 1960 .129 1988 .015

1965 to 1994 segment:

Lower 1980> -.044 1989> -.030 1993< -.023 1967> -.020 1981> -.019 1972> -.019 Higher 1988 .045 1973 .028

1980 to 2009 segment:

Lower 2001> -.173 1993< -.032 1980> -.022 1994< -.021 1984< -.020 1996> -.014 Higher 2000 .126 1988 .054

1983 to 2012 segment:

Lower 2001> -.189 1993< -.024 1989> -.019 1996> -.018 1994< -.017 1984< -.014 Higher 2000 .137 1988 .049

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

2001 +3.5 SD

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631A 1954 to 2012 59 years Series 7

[B] Entire series, effect on correlation ( .508) is:

Lower 2000> -.043 1980> -.031 1960> -.029 1997> -.020 1968> -.019 1981< -.015 Higher 2001 .041 1988 .019

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

1980 +3.2 SD

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631B 1954 to 2012 59 years Series 8

[B] Entire series, effect on correlation ( .600) is:

Lower 1970< -.021 1980> -.019 1996< -.016 1972> -.015 1969< -.014 2000> -.013 Higher 1960 .066 2001 .014

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632A 1943 to 2012 70 years Series 9

[B] Entire series, effect on correlation ( .609) is:

Lower 1948> -.034 1985> -.027 1947< -.027 1998< -.021 2009> -.019 1982> -.018 Higher 1960 .190 1988 .016

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632B 1953 to 2012 60 years Series 10

[B] Entire series, effect on correlation ( .762) is:

Lower 2001> -.022 1980> -.017 2009> -.017 1984< -.017 1990< -.014 2010< -.009 Higher 1960 .190 1985 .009

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634A 1951 to 2012 62 years Series 11

[B] Entire series, effect on correlation ( .740) is:

Lower 1979< -.017 2000> -.015 1972> -.013 1951< -.012 1977< -.010 1978< -.010 Higher 1960 .165 2001 .021

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634B 1943 to 2012 70 years Series 12

[B] Entire series, effect on correlation ( .791) is:

Lower 2001> -.018 2000> -.012 2008< -.010 1962> -.009 1955< -.009 1976> -.008 Higher 1960 .150 1985 .007

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635A 1950 to 2012 63 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

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

1980 2009 -5 .01 -.12 -.34 -.39 -.12 .38\* .14 -.01 .01 .23 .37|-.07 -.10 .22 - - - - - - -

1983 2012 -5 -.10 -.12 -.35 -.43 -.15 .42\* .20 -.04 -.06 .20 .38| - - - - - - - - - -

[B] Entire series, effect on correlation ( .577) is:

Lower 2006< -.065 1950< -.060 2005< -.027 2009> -.017 1997< -.014 1980> -.011 Higher 1960 .126 1985 .021

1980 to 2009 segment:

Lower 2006< -.147 2005< -.058 2009> -.037 1997< -.023 1980> -.022 2004> -.021 Higher 1985 .108 1988 .068

1983 to 2012 segment:

Lower 2006< -.134 2005< -.050 2009> -.041 2004> -.025 1997< -.016 2012< -.014 Higher 1985 .118 1988 .060

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635B 1946 to 2012 67 years Series 14

[B] Entire series, effect on correlation ( .477) is:

Lower 1959< -.024 1960> -.023 1980> -.021 1992> -.017 1954> -.015 2005< -.013 Higher 2001 .043 1985 .016

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PART 7: DESCRIPTIVE STATISTICS: Final 16:36 Mon 08 Jul 2013 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 608A 1945 2012 68 5 2 .498 2.61 5.06 .821 .603 .224 2.38 .403 .001 1

2 609A 1944 2012 69 5 3 .558 1.79 5.26 1.341 .834 .492 2.50 .459 .016 3

3 613A 1970 2012 43 3 1 .572 3.12 4.77 .848 .508 .234 2.47 .517 .097 1

4 613B 1941 2012 72 5 0 .668 2.88 5.39 1.353 .856 .247 2.52 .453 -.043 1

5 629A 1955 2012 58 4 1 .575 4.53 8.01 1.227 .629 .211 2.76 .669 -.031 1

6 629B 1956 2012 57 4 3 .518 3.64 5.59 1.012 .427 .228 2.47 .497 -.108 1

7 631A 1954 2012 59 4 0 .508 2.90 5.43 1.246 .820 .187 2.68 .480 .026 1

8 631B 1954 2012 59 4 0 .600 2.71 5.36 1.180 .863 .195 2.53 .493 .029 1

9 632A 1943 2012 70 5 0 .609 1.51 2.95 .777 .831 .256 2.57 .425 -.068 2

10 632B 1953 2012 60 4 0 .762 1.96 4.99 1.250 .879 .262 2.43 .350 -.023 1

11 634A 1951 2012 62 4 0 .740 2.65 4.06 .535 .514 .155 2.58 .399 -.007 1

12 634B 1943 2012 70 5 0 .791 2.48 3.65 .515 .497 .166 2.40 .331 -.084 1

13 635A 1950 2012 63 4 2 .577 3.32 7.88 1.214 .752 .187 2.58 .573 .001 1

14 635B 1946 2012 67 5 0 .477 2.87 5.31 .797 .830 .125 2.49 .466 .007 2

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Total or mean: 877 61 12 .606 2.74 8.01 1.007 .710 .228 2.76 .461 -.016

- = [ COFECHA FIN1 COF ] = -