

Supplementary Materials

Table S1. Ponderosa pine tree-ring data obtained from the (International Tree-Ring Data Bank) ITRDB, except where noted. Three taxa were analyzed, three (3)-, five (5)-, and mixed (M)-needle types at two sites: Mt. Bigelow (BIG) and Mt. Lemmon (MTL). ID = site code for data files, N = the number of trees sampled. Fritts' trees were sampled from an earlier period (pre-1949) than Marquardt et al. (post-1950).

Site	Taxon	ID	Lat	Long	Elev (m)	N	Scholar	Source
BIG	3	63100	32°22'	110° 43'	2500	6	Fritts [11,12]	LTRR, Tucson, AZ; citation doi.org/10.2307/1942448
BIG	5	65100	32°22'	110° 43'	2500	6	Fritts	LTRR, Tucson, AZ; citation doi.org/10.2307/1942448
BIG	M	64100	32°22'	110° 43'	2500	6	Fritts	LTRR, Tucson, AZ; citation doi.org/10.2307/1942448
BIG	3	AZ599	32.414	-110.715	2534	7	Marquardt et al.[13]	www.ncdc.noaa.gov/paleo/study
BIG	5	AZ600	32.414	-110.715	2534	7	Marquardt et al.	www.ncdc.noaa.gov/paleo/study
BIG	M	AZ601	32.414	-110.715	2534	6	Marquardt et al.	www.ncdc.noaa.gov/paleo/study
MTL	3	AZ602	32.434	-110.790	2577	7	Marquardt et al.	www.ncdc.noaa.gov/paleo/study
MTL	5	AZ603	32.434	-110.790	2577	6	Marquardt et al.	www.ncdc.noaa.gov/paleo/study
MTL	M	AZ604	32.434	-110.790	2577	7	Marquardt et al.	www.ncdc.noaa.gov/paleo/study

The tree-ring datasets that were generated and analyzed for recent (R) period were deposited with the ITRDB repository listed above. These R datasets included the raw ring-widths for 40 trees (95 radii) and 6 composite chronologies listed in “Methods”. The early period (E) dataset, which included 3 composite chronologies developed from 18 trees (36 radii), can be obtained from the authors or the Laboratory of TREE Ring Research (LTRR; <https://ltrr.arizona.edu/>)



Table S2. Coefficients and confidence intervals (CI) for Table 2 response function seasonal precipitation-growth analysis.

	Site	Period	Taxon	Season	Coefficient	Lower_CI	Upper_CI	Significant
1	BIG	Early	3N	PrSum	0.12	-0.09	0.31	FALSE
2	BIG	Early	3N	Winter	0.20	0.00	0.37	FALSE
3	BIG	Early	3N	Spring	0.04	-0.19	0.37	FALSE
4	BIG	Early	3N	Summer	0.32	0.01	0.56	TRUE
9	BIG	Early	MN	PrSum	0.11	-0.06	0.30	FALSE
10	BIG	Early	MN	Winter	0.26	0.08	0.42	TRUE
11	BIG	Early	MN	Spring	0.05	-0.18	0.38	FALSE
12	BIG	Early	MN	Summer	0.29	0.04	0.51	TRUE
17	BIG	Early	5N	PrSum	-0.02	-0.18	0.17	FALSE
18	BIG	Early	5N	Winter	0.21	0.05	0.38	TRUE
19	BIG	Early	5N	Spring	0.02	-0.20	0.27	FALSE
20	BIG	Early	5N	Summer	0.26	0.06	0.50	TRUE
25	BIG	Recent	3N	PrSum	-0.03	-0.25	0.20	FALSE
26	BIG	Recent	3N	Winter	0.17	-0.06	0.41	FALSE
27	BIG	Recent	3N	Spring	0.32	0.15	0.49	TRUE
28	BIG	Recent	3N	Summer	0.02	-0.21	0.31	FALSE
33	BIG	Recent	MN	PrSum	-0.07	-0.28	0.18	FALSE
34	BIG	Recent	MN	Winter	0.14	-0.09	0.34	FALSE
35	BIG	Recent	MN	Spring	0.26	0.10	0.42	TRUE
36	BIG	Recent	MN	Summer	0.04	-0.17	0.32	FALSE
41	BIG	Recent	5N	PrSum	-0.12	-0.31	0.07	FALSE
42	BIG	Recent	5N	Winter	0.17	-0.05	0.42	FALSE
43	BIG	Recent	5N	Spring	0.24	0.03	0.44	TRUE
44	BIG	Recent	5N	Summer	0.01	-0.18	0.24	FALSE
49	MTL	Recent	3N	PrSum	-0.21	-0.42	0.01	FALSE
50	MTL	Recent	3N	Winter	0.16	-0.08	0.36	FALSE
51	MTL	Recent	3N	Spring	0.32	0.11	0.49	TRUE
52	MTL	Recent	3N	Summer	0.04	-0.18	0.22	FALSE
57	MTL	Recent	MN	PrSum	-0.16	-0.31	0.05	FALSE
58	MTL	Recent	MN	Winter	0.35	0.14	0.50	TRUE
59	MTL	Recent	MN	Spring	0.38	0.17	0.54	TRUE
60	MTL	Recent	MN	Summer	0.06	-0.12	0.26	FALSE
65	MTL	Recent	5N	PrSum	0.00	-0.16	0.16	FALSE
66	MTL	Recent	5N	Winter	0.31	0.11	0.52	TRUE
67	MTL	Recent	5N	Spring	0.39	0.21	0.54	TRUE
68	MTL	Recent	5N	Summer	0.08	-0.11	0.30	FALSE

Two sites [Mt. Bigelow (BIG); Mt. Lemmon (MTL)]; two periods (Early, Recent); three taxa [three-needle (3N), mixed-needle (MN), five-needle (5N)]; four seasons: PrSum=previous summer (July-September); winter (November-March); spring (April-June); summer (July-September).

Table S3. Coefficients and confidence intervals (CI) for Fig. 3 moving window seasonal TAVG growth analysis.

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
1	BIG	Early	3N	1895.1924	PrSum	-0.39	-0.64	-0.09	TRUE
2	BIG	Early	3N	1895.1924	PrevFall	-0.31	-0.57	-0.01	TRUE
3	BIG	Early	3N	1895.1924	Winter	-0.01	-0.37	0.31	FALSE
4	BIG	Early	3N	1895.1924	Spring	-0.41	-0.71	0.02	FALSE
5	BIG	Early	3N	1895.1924	Summer	-0.18	-0.43	0.09	FALSE
6	BIG	Early	3N	1895.1924	Fall	-0.13	-0.39	0.13	FALSE
7	BIG	Early	3N	1900.1929	PrSum	-0.43	-0.66	-0.14	TRUE
8	BIG	Early	3N	1900.1929	PrevFall	-0.19	-0.43	0.09	FALSE
9	BIG	Early	3N	1900.1929	Winter	0.05	-0.33	0.37	FALSE
10	BIG	Early	3N	1900.1929	Spring	-0.29	-0.69	0.20	FALSE
11	BIG	Early	3N	1900.1929	Summer	-0.36	-0.58	-0.13	TRUE
12	BIG	Early	3N	1900.1929	Fall	-0.25	-0.48	0.00	FALSE
13	BIG	Early	3N	1905.1934	PrSum	-0.43	-0.67	-0.14	TRUE
14	BIG	Early	3N	1905.1934	PrevFall	-0.25	-0.53	0.07	FALSE
15	BIG	Early	3N	1905.1934	Winter	-0.04	-0.47	0.37	FALSE
16	BIG	Early	3N	1905.1934	Spring	-0.21	-0.66	0.32	FALSE
17	BIG	Early	3N	1905.1934	Summer	-0.40	-0.61	-0.17	TRUE
18	BIG	Early	3N	1905.1934	Fall	-0.35	-0.61	-0.09	TRUE
19	BIG	Early	3N	1910.1939	PrSum	-0.43	-0.64	-0.11	TRUE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
21	BIG	Early	3N	1910.1939	Winter	-0.03	-0.45	0.41	FALSE
22	BIG	Early	3N	1910.1939	Spring	-0.31	-0.70	0.14	FALSE
23	BIG	Early	3N	1910.1939	Summer	-0.40	-0.61	-0.19	TRUE
24	BIG	Early	3N	1910.1939	Fall	-0.48	-0.73	-0.20	TRUE
25	BIG	Early	3N	1915.1944	PrSum	-0.52	-0.72	-0.22	TRUE
26	BIG	Early	3N	1915.1944	PrevFall	-0.42	-0.63	-0.16	TRUE
27	BIG	Early	3N	1915.1944	Winter	-0.12	-0.47	0.30	FALSE
28	BIG	Early	3N	1915.1944	Spring	-0.21	-0.61	0.28	FALSE
29	BIG	Early	3N	1915.1944	Summer	-0.41	-0.60	-0.18	TRUE
30	BIG	Early	3N	1915.1944	Fall	-0.39	-0.72	-0.04	TRUE
31	BIG	Early	3N	1920.1949	PrSum	-0.55	-0.75	-0.31	TRUE
32	BIG	Early	3N	1920.1949	PrevFall	-0.19	-0.54	0.20	FALSE
33	BIG	Early	3N	1920.1949	Winter	0.00	-0.30	0.31	FALSE
34	BIG	Early	3N	1920.1949	Spring	-0.29	-0.63	0.08	FALSE
35	BIG	Early	3N	1920.1949	Summer	-0.50	-0.70	-0.28	TRUE
36	BIG	Early	3N	1920.1949	Fall	-0.14	-0.49	0.27	FALSE
37	BIG	Early	MN	1895.1924	PrSum	-0.43	-0.66	-0.16	TRUE
38	BIG	Early	MN	1895.1924	PrevFall	-0.23	-0.50	0.08	FALSE
39	BIG	Early	MN	1895.1924	Winter	0.06	-0.40	0.38	FALSE
40	BIG	Early	MN	1895.1924	Spring	-0.38	-0.67	0.02	FALSE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
41	BIG	Early	MN	1895.1924	Summer	-0.16	-0.43	0.12	FALSE
42	BIG	Early	MN	1895.1924	Fall	-0.14	-0.38	0.14	FALSE
43	BIG	Early	MN	1900.1929	PrSum	-0.43	-0.64	-0.15	TRUE
44	BIG	Early	MN	1900.1929	PrevFall	-0.10	-0.37	0.22	FALSE
45	BIG	Early	MN	1900.1929	Winter	0.10	-0.32	0.42	FALSE
46	BIG	Early	MN	1900.1929	Spring	-0.32	-0.65	0.14	FALSE
47	BIG	Early	MN	1900.1929	Summer	-0.30	-0.54	-0.06	TRUE
48	BIG	Early	MN	1900.1929	Fall	-0.23	-0.44	0.04	FALSE
49	BIG	Early	MN	1905.1934	PrSum	-0.44	-0.66	-0.17	TRUE
50	BIG	Early	MN	1905.1934	PrevFall	-0.15	-0.48	0.24	FALSE
51	BIG	Early	MN	1905.1934	Winter	0.00	-0.46	0.46	FALSE
52	BIG	Early	MN	1905.1934	Spring	-0.24	-0.61	0.31	FALSE
53	BIG	Early	MN	1905.1934	Summer	-0.31	-0.55	-0.03	TRUE
54	BIG	Early	MN	1905.1934	Fall	-0.28	-0.53	0.04	FALSE
55	BIG	Early	MN	1910.1939	PrSum	-0.41	-0.62	-0.14	TRUE
56	BIG	Early	MN	1910.1939	PrevFall	-0.26	-0.52	0.02	FALSE
57	BIG	Early	MN	1910.1939	Winter	-0.07	-0.50	0.40	FALSE
58	BIG	Early	MN	1910.1939	Spring	-0.33	-0.68	0.20	FALSE
59	BIG	Early	MN	1910.1939	Summer	-0.30	-0.50	-0.09	TRUE
60	BIG	Early	MN	1910.1939	Fall	-0.42	-0.65	-0.13	TRUE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
61	BIG	Early	MN	1915.1944	PrSum	-0.50	-0.71	-0.19	TRUE
62	BIG	Early	MN	1915.1944	PrevFall	-0.38	-0.66	-0.06	TRUE
63	BIG	Early	MN	1915.1944	Winter	-0.17	-0.54	0.29	FALSE
64	BIG	Early	MN	1915.1944	Spring	-0.32	-0.67	0.15	FALSE
65	BIG	Early	MN	1915.1944	Summer	-0.33	-0.55	-0.11	TRUE
66	BIG	Early	MN	1915.1944	Fall	-0.39	-0.66	-0.04	TRUE
67	BIG	Early	MN	1920.1949	PrSum	-0.48	-0.70	-0.22	TRUE
68	BIG	Early	MN	1920.1949	PrevFall	-0.14	-0.55	0.27	FALSE
69	BIG	Early	MN	1920.1949	Winter	-0.07	-0.39	0.25	FALSE
70	BIG	Early	MN	1920.1949	Spring	-0.33	-0.63	0.05	FALSE
71	BIG	Early	MN	1920.1949	Summer	-0.45	-0.66	-0.20	TRUE
72	BIG	Early	MN	1920.1949	Fall	-0.16	-0.52	0.22	FALSE
73	BIG	Early	5N	1895.1924	PrSum	-0.36	-0.59	-0.05	TRUE
74	BIG	Early	5N	1895.1924	PrevFall	-0.19	-0.47	0.12	FALSE
75	BIG	Early	5N	1895.1924	Winter	0.08	-0.35	0.40	FALSE
76	BIG	Early	5N	1895.1924	Spring	-0.22	-0.56	0.22	FALSE
77	BIG	Early	5N	1895.1924	Summer	-0.09	-0.38	0.22	FALSE
78	BIG	Early	5N	1895.1924	Fall	-0.19	-0.42	0.11	FALSE
79	BIG	Early	5N	1900.1929	PrSum	-0.35	-0.57	-0.04	TRUE
80	BIG	Early	5N	1900.1929	PrevFall	-0.07	-0.36	0.28	FALSE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
81	BIG	Early	5N	1900.1929	Winter	0.16	-0.19	0.42	FALSE
82	BIG	Early	5N	1900.1929	Spring	-0.12	-0.49	0.31	FALSE
83	BIG	Early	5N	1900.1929	Summer	-0.21	-0.51	0.10	FALSE
84	BIG	Early	5N	1900.1929	Fall	-0.22	-0.46	0.07	FALSE
85	BIG	Early	5N	1905.1934	PrSum	-0.37	-0.63	-0.06	TRUE
86	BIG	Early	5N	1905.1934	PrevFall	-0.12	-0.44	0.35	FALSE
87	BIG	Early	5N	1905.1934	Winter	0.12	-0.32	0.54	FALSE
88	BIG	Early	5N	1905.1934	Spring	-0.11	-0.52	0.41	FALSE
89	BIG	Early	5N	1905.1934	Summer	-0.28	-0.56	-0.01	TRUE
90	BIG	Early	5N	1905.1934	Fall	-0.29	-0.50	0.03	FALSE
91	BIG	Early	5N	1910.1939	PrSum	-0.24	-0.52	0.13	FALSE
92	BIG	Early	5N	1910.1939	PrevFall	-0.06	-0.42	0.43	FALSE
93	BIG	Early	5N	1910.1939	Winter	0.01	-0.42	0.45	FALSE
94	BIG	Early	5N	1910.1939	Spring	-0.03	-0.45	0.42	FALSE
95	BIG	Early	5N	1910.1939	Summer	-0.23	-0.49	0.02	FALSE
96	BIG	Early	5N	1910.1939	Fall	-0.29	-0.52	-0.03	TRUE
97	BIG	Early	5N	1915.1944	PrSum	-0.28	-0.54	0.06	FALSE
98	BIG	Early	5N	1915.1944	PrevFall	-0.12	-0.45	0.28	FALSE
99	BIG	Early	5N	1915.1944	Winter	0.01	-0.40	0.45	FALSE
100	BIG	Early	5N	1915.1944	Spring	0.07	-0.35	0.47	FALSE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
101	BIG	Early	5N	1915.1944	Summer	-0.24	-0.47	0.01	FALSE
102	BIG	Early	5N	1915.1944	Fall	-0.22	-0.46	0.05	FALSE
103	BIG	Early	5N	1920.1949	PrSum	-0.32	-0.55	-0.05	TRUE
104	BIG	Early	5N	1920.1949	PrevFall	0.12	-0.27	0.47	FALSE
105	BIG	Early	5N	1920.1949	Winter	0.00	-0.38	0.40	FALSE
106	BIG	Early	5N	1920.1949	Spring	-0.11	-0.44	0.28	FALSE
107	BIG	Early	5N	1920.1949	Summer	-0.41	-0.64	-0.14	TRUE
108	BIG	Early	5N	1920.1949	Fall	0.02	-0.29	0.35	FALSE
109	BIG	Recent	3N	1950.1979	PrSum	-0.25	-0.56	0.08	FALSE
110	BIG	Recent	3N	1950.1979	PrevFall	0.01	-0.30	0.33	FALSE
111	BIG	Recent	3N	1950.1979	Winter	-0.29	-0.60	0.11	FALSE
112	BIG	Recent	3N	1950.1979	Spring	-0.49	-0.73	-0.09	TRUE
113	BIG	Recent	3N	1950.1979	Summer	0.04	-0.24	0.34	FALSE
114	BIG	Recent	3N	1950.1979	Fall	0.23	-0.12	0.57	FALSE
115	BIG	Recent	3N	1955.1984	PrSum	-0.32	-0.57	0.06	FALSE
116	BIG	Recent	3N	1955.1984	PrevFall	-0.02	-0.40	0.35	FALSE
117	BIG	Recent	3N	1955.1984	Winter	-0.25	-0.53	0.13	FALSE
118	BIG	Recent	3N	1955.1984	Spring	-0.34	-0.64	0.08	FALSE
119	BIG	Recent	3N	1955.1984	Summer	-0.03	-0.31	0.27	FALSE
120	BIG	Recent	3N	1955.1984	Fall	0.43	0.16	0.65	TRUE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
121	BIG	Recent	3N	1960.1989	PrSum	-0.36	-0.58	-0.10	TRUE
122	BIG	Recent	3N	1960.1989	PrevFall	0.16	-0.22	0.47	FALSE
123	BIG	Recent	3N	1960.1989	Winter	-0.24	-0.54	0.12	FALSE
124	BIG	Recent	3N	1960.1989	Spring	-0.24	-0.61	0.21	FALSE
125	BIG	Recent	3N	1960.1989	Summer	0.01	-0.26	0.30	FALSE
126	BIG	Recent	3N	1960.1989	Fall	0.56	0.31	0.75	TRUE
127	BIG	Recent	3N	1965.1994	PrSum	-0.24	-0.49	-0.01	TRUE
128	BIG	Recent	3N	1965.1994	PrevFall	0.20	-0.18	0.52	FALSE
129	BIG	Recent	3N	1965.1994	Winter	-0.31	-0.58	0.01	FALSE
130	BIG	Recent	3N	1965.1994	Spring	-0.01	-0.37	0.35	FALSE
131	BIG	Recent	3N	1965.1994	Summer	0.05	-0.23	0.33	FALSE
132	BIG	Recent	3N	1965.1994	Fall	0.40	0.05	0.67	TRUE
133	BIG	Recent	3N	1970.1999	PrSum	0.21	-0.15	0.55	FALSE
134	BIG	Recent	3N	1970.1999	PrevFall	0.08	-0.26	0.39	FALSE
135	BIG	Recent	3N	1970.1999	Winter	-0.15	-0.48	0.27	FALSE
136	BIG	Recent	3N	1970.1999	Spring	-0.11	-0.44	0.22	FALSE
137	BIG	Recent	3N	1970.1999	Summer	0.26	-0.05	0.56	FALSE
138	BIG	Recent	3N	1970.1999	Fall	0.49	0.14	0.76	TRUE
139	BIG	Recent	3N	1975.2004	PrSum	0.15	-0.18	0.45	FALSE
140	BIG	Recent	3N	1975.2004	PrevFall	-0.17	-0.44	0.10	FALSE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
141	BIG	Recent	3N	1975.2004	Winter	-0.17	-0.47	0.27	FALSE
142	BIG	Recent	3N	1975.2004	Spring	-0.22	-0.58	0.18	FALSE
143	BIG	Recent	3N	1975.2004	Summer	0.14	-0.16	0.45	FALSE
144	BIG	Recent	3N	1975.2004	Fall	0.40	0.01	0.67	TRUE
145	BIG	Recent	MN	1950.1979	PrSum	-0.17	-0.47	0.18	FALSE
146	BIG	Recent	MN	1950.1979	PrevFall	-0.14	-0.48	0.26	FALSE
147	BIG	Recent	MN	1950.1979	Winter	-0.27	-0.61	0.13	FALSE
148	BIG	Recent	MN	1950.1979	Spring	-0.44	-0.67	-0.10	TRUE
149	BIG	Recent	MN	1950.1979	Summer	-0.06	-0.36	0.27	FALSE
150	BIG	Recent	MN	1950.1979	Fall	0.23	-0.11	0.52	FALSE
151	BIG	Recent	MN	1955.1984	PrSum	-0.20	-0.50	0.21	FALSE
152	BIG	Recent	MN	1955.1984	PrevFall	-0.08	-0.46	0.31	FALSE
153	BIG	Recent	MN	1955.1984	Winter	-0.28	-0.58	0.09	FALSE
154	BIG	Recent	MN	1955.1984	Spring	-0.30	-0.63	0.08	FALSE
155	BIG	Recent	MN	1955.1984	Summer	-0.01	-0.29	0.31	FALSE
156	BIG	Recent	MN	1955.1984	Fall	0.41	0.12	0.62	TRUE
157	BIG	Recent	MN	1960.1989	PrSum	-0.02	-0.35	0.33	FALSE
158	BIG	Recent	MN	1960.1989	PrevFall	0.16	-0.20	0.53	FALSE
159	BIG	Recent	MN	1960.1989	Winter	-0.38	-0.67	-0.01	TRUE
160	BIG	Recent	MN	1960.1989	Spring	-0.39	-0.65	-0.03	TRUE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
161	BIG	Recent	MN	1960.1989	Summer	0.11	-0.21	0.40	FALSE
162	BIG	Recent	MN	1960.1989	Fall	0.48	0.23	0.67	TRUE
163	BIG	Recent	MN	1965.1994	PrSum	-0.02	-0.29	0.28	FALSE
164	BIG	Recent	MN	1965.1994	PrevFall	0.18	-0.19	0.50	FALSE
165	BIG	Recent	MN	1965.1994	Winter	-0.44	-0.72	-0.07	TRUE
166	BIG	Recent	MN	1965.1994	Spring	-0.23	-0.55	0.13	FALSE
167	BIG	Recent	MN	1965.1994	Summer	0.14	-0.14	0.39	FALSE
168	BIG	Recent	MN	1965.1994	Fall	0.38	0.10	0.62	TRUE
169	BIG	Recent	MN	1970.1999	PrSum	0.41	0.05	0.69	TRUE
170	BIG	Recent	MN	1970.1999	PrevFall	0.15	-0.18	0.45	FALSE
171	BIG	Recent	MN	1970.1999	Winter	-0.20	-0.57	0.21	FALSE
172	BIG	Recent	MN	1970.1999	Spring	-0.28	-0.55	0.07	FALSE
173	BIG	Recent	MN	1970.1999	Summer	0.32	0.03	0.60	TRUE
174	BIG	Recent	MN	1970.1999	Fall	0.53	0.24	0.72	TRUE
175	BIG	Recent	MN	1975.2004	PrSum	0.34	0.01	0.62	TRUE
176	BIG	Recent	MN	1975.2004	PrevFall	0.04	-0.29	0.36	FALSE
177	BIG	Recent	MN	1975.2004	Winter	-0.14	-0.53	0.34	FALSE
178	BIG	Recent	MN	1975.2004	Spring	-0.32	-0.62	0.05	FALSE
179	BIG	Recent	MN	1975.2004	Summer	0.28	-0.04	0.55	FALSE
180	BIG	Recent	MN	1975.2004	Fall	0.45	0.14	0.69	TRUE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
181	BIG	Recent	5N	1950.1979	PrSum	-0.17	-0.48	0.23	FALSE
182	BIG	Recent	5N	1950.1979	PrevFall	0.06	-0.34	0.39	FALSE
183	BIG	Recent	5N	1950.1979	Winter	-0.24	-0.52	0.12	FALSE
184	BIG	Recent	5N	1950.1979	Spring	-0.33	-0.68	0.06	FALSE
185	BIG	Recent	5N	1950.1979	Summer	0.07	-0.21	0.37	FALSE
186	BIG	Recent	5N	1950.1979	Fall	0.31	0.04	0.53	TRUE
187	BIG	Recent	5N	1955.1984	PrSum	-0.24	-0.52	0.22	FALSE
188	BIG	Recent	5N	1955.1984	PrevFall	0.00	-0.39	0.36	FALSE
189	BIG	Recent	5N	1955.1984	Winter	-0.26	-0.54	0.12	FALSE
190	BIG	Recent	5N	1955.1984	Spring	-0.24	-0.61	0.14	FALSE
191	BIG	Recent	5N	1955.1984	Summer	0.00	-0.26	0.30	FALSE
192	BIG	Recent	5N	1955.1984	Fall	0.38	0.14	0.59	TRUE
193	BIG	Recent	5N	1960.1989	PrSum	-0.29	-0.54	0.00	TRUE
194	BIG	Recent	5N	1960.1989	PrevFall	0.15	-0.28	0.49	FALSE
195	BIG	Recent	5N	1960.1989	Winter	-0.24	-0.55	0.11	FALSE
196	BIG	Recent	5N	1960.1989	Spring	-0.03	-0.44	0.33	FALSE
197	BIG	Recent	5N	1960.1989	Summer	0.09	-0.21	0.40	FALSE
198	BIG	Recent	5N	1960.1989	Fall	0.52	0.25	0.72	TRUE
199	BIG	Recent	5N	1965.1994	PrSum	-0.13	-0.41	0.15	FALSE
200	BIG	Recent	5N	1965.1994	PrevFall	0.25	-0.15	0.61	FALSE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
201	BIG	Recent	5N	1965.1994	Winter	-0.31	-0.56	0.03	FALSE
202	BIG	Recent	5N	1965.1994	Spring	0.15	-0.21	0.46	FALSE
203	BIG	Recent	5N	1965.1994	Summer	0.15	-0.17	0.44	FALSE
204	BIG	Recent	5N	1965.1994	Fall	0.41	0.07	0.68	TRUE
205	BIG	Recent	5N	1970.1999	PrSum	0.42	0.08	0.66	TRUE
206	BIG	Recent	5N	1970.1999	PrevFall	0.17	-0.19	0.46	FALSE
207	BIG	Recent	5N	1970.1999	Winter	-0.04	-0.38	0.34	FALSE
208	BIG	Recent	5N	1970.1999	Spring	0.00	-0.36	0.40	FALSE
209	BIG	Recent	5N	1970.1999	Summer	0.39	0.05	0.67	TRUE
210	BIG	Recent	5N	1970.1999	Fall	0.57	0.23	0.80	TRUE
211	BIG	Recent	5N	1975.2004	PrSum	0.38	0.09	0.63	TRUE
212	BIG	Recent	5N	1975.2004	PrevFall	-0.03	-0.36	0.32	FALSE
213	BIG	Recent	5N	1975.2004	Winter	-0.01	-0.34	0.39	FALSE
214	BIG	Recent	5N	1975.2004	Spring	-0.03	-0.38	0.40	FALSE
215	BIG	Recent	5N	1975.2004	Summer	0.31	-0.04	0.59	FALSE
216	BIG	Recent	5N	1975.2004	Fall	0.43	0.06	0.67	TRUE
217	MTL	Recent	3N	1950.1979	PrSum	0.07	-0.33	0.47	FALSE
218	MTL	Recent	3N	1950.1979	PrevFall	0.09	-0.26	0.36	FALSE
219	MTL	Recent	3N	1950.1979	Winter	-0.18	-0.49	0.18	FALSE
220	MTL	Recent	3N	1950.1979	Spring	-0.22	-0.55	0.18	FALSE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
221	MTL	Recent	3N	1950.1979	Summer	0.16	-0.15	0.45	FALSE
222	MTL	Recent	3N	1950.1979	Fall	0.20	-0.16	0.51	FALSE
223	MTL	Recent	3N	1955.1984	PrSum	-0.20	-0.53	0.17	FALSE
224	MTL	Recent	3N	1955.1984	PrevFall	-0.01	-0.33	0.30	FALSE
225	MTL	Recent	3N	1955.1984	Winter	-0.25	-0.51	0.02	FALSE
226	MTL	Recent	3N	1955.1984	Spring	-0.13	-0.53	0.32	FALSE
227	MTL	Recent	3N	1955.1984	Summer	-0.05	-0.35	0.24	FALSE
228	MTL	Recent	3N	1955.1984	Fall	0.21	-0.11	0.46	FALSE
229	MTL	Recent	3N	1960.1989	PrSum	-0.18	-0.49	0.15	FALSE
230	MTL	Recent	3N	1960.1989	PrevFall	0.13	-0.23	0.45	FALSE
231	MTL	Recent	3N	1960.1989	Winter	-0.20	-0.48	0.06	FALSE
232	MTL	Recent	3N	1960.1989	Spring	-0.24	-0.61	0.20	FALSE
233	MTL	Recent	3N	1960.1989	Summer	-0.07	-0.37	0.25	FALSE
234	MTL	Recent	3N	1960.1989	Fall	0.19	-0.10	0.44	FALSE
235	MTL	Recent	3N	1965.1994	PrSum	-0.11	-0.42	0.17	FALSE
236	MTL	Recent	3N	1965.1994	PrevFall	0.12	-0.25	0.43	FALSE
237	MTL	Recent	3N	1965.1994	Winter	-0.25	-0.52	0.04	FALSE
238	MTL	Recent	3N	1965.1994	Spring	-0.12	-0.55	0.22	FALSE
239	MTL	Recent	3N	1965.1994	Summer	-0.17	-0.45	0.13	FALSE
240	MTL	Recent	3N	1965.1994	Fall	0.12	-0.19	0.41	FALSE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
241	MTL	Recent	3N	1970.1999	PrSum	0.00	-0.34	0.35	FALSE
242	MTL	Recent	3N	1970.1999	PrevFall	-0.19	-0.52	0.18	FALSE
243	MTL	Recent	3N	1970.1999	Winter	-0.30	-0.57	-0.01	TRUE
244	MTL	Recent	3N	1970.1999	Spring	-0.25	-0.64	0.12	FALSE
245	MTL	Recent	3N	1970.1999	Summer	-0.14	-0.39	0.16	FALSE
246	MTL	Recent	3N	1970.1999	Fall	0.08	-0.18	0.37	FALSE
247	MTL	Recent	3N	1975.2004	PrSum	-0.04	-0.36	0.30	FALSE
248	MTL	Recent	3N	1975.2004	PrevFall	-0.49	-0.75	-0.15	TRUE
249	MTL	Recent	3N	1975.2004	Winter	-0.46	-0.70	-0.17	TRUE
250	MTL	Recent	3N	1975.2004	Spring	-0.36	-0.71	0.06	FALSE
251	MTL	Recent	3N	1975.2004	Summer	-0.22	-0.49	0.09	FALSE
252	MTL	Recent	3N	1975.2004	Fall	0.22	-0.10	0.49	FALSE
253	MTL	Recent	MN	1950.1979	PrSum	0.02	-0.31	0.30	FALSE
254	MTL	Recent	MN	1950.1979	PrevFall	-0.12	-0.39	0.22	FALSE
255	MTL	Recent	MN	1950.1979	Winter	-0.21	-0.47	0.15	FALSE
256	MTL	Recent	MN	1950.1979	Spring	-0.25	-0.50	0.09	FALSE
257	MTL	Recent	MN	1950.1979	Summer	0.01	-0.34	0.29	FALSE
258	MTL	Recent	MN	1950.1979	Fall	0.23	-0.09	0.51	FALSE
259	MTL	Recent	MN	1955.1984	PrSum	-0.03	-0.38	0.28	FALSE
260	MTL	Recent	MN	1955.1984	PrevFall	-0.05	-0.35	0.29	FALSE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
261	MTL	Recent	MN	1955.1984	Winter	-0.24	-0.50	0.09	FALSE
262	MTL	Recent	MN	1955.1984	Spring	-0.21	-0.50	0.11	FALSE
263	MTL	Recent	MN	1955.1984	Summer	0.04	-0.35	0.34	FALSE
264	MTL	Recent	MN	1955.1984	Fall	0.24	-0.12	0.50	FALSE
265	MTL	Recent	MN	1960.1989	PrSum	-0.08	-0.40	0.18	FALSE
266	MTL	Recent	MN	1960.1989	PrevFall	0.09	-0.19	0.38	FALSE
267	MTL	Recent	MN	1960.1989	Winter	-0.20	-0.50	0.21	FALSE
268	MTL	Recent	MN	1960.1989	Spring	-0.22	-0.52	0.17	FALSE
269	MTL	Recent	MN	1960.1989	Summer	-0.08	-0.44	0.26	FALSE
270	MTL	Recent	MN	1960.1989	Fall	0.23	-0.19	0.52	FALSE
271	MTL	Recent	MN	1965.1994	PrSum	0.05	-0.19	0.26	FALSE
272	MTL	Recent	MN	1965.1994	PrevFall	0.13	-0.21	0.42	FALSE
273	MTL	Recent	MN	1965.1994	Winter	-0.27	-0.56	0.09	FALSE
274	MTL	Recent	MN	1965.1994	Spring	-0.08	-0.44	0.29	FALSE
275	MTL	Recent	MN	1965.1994	Summer	-0.08	-0.42	0.22	FALSE
276	MTL	Recent	MN	1965.1994	Fall	0.20	-0.18	0.50	FALSE
277	MTL	Recent	MN	1970.1999	PrSum	-0.08	-0.36	0.25	FALSE
278	MTL	Recent	MN	1970.1999	PrevFall	-0.11	-0.45	0.25	FALSE
279	MTL	Recent	MN	1970.1999	Winter	-0.39	-0.67	-0.05	TRUE
280	MTL	Recent	MN	1970.1999	Spring	-0.17	-0.55	0.21	FALSE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
281	MTL	Recent	MN	1970.1999	Summer	-0.13	-0.39	0.16	FALSE
282	MTL	Recent	MN	1970.1999	Fall	0.03	-0.32	0.35	FALSE
283	MTL	Recent	MN	1975.2004	PrSum	-0.19	-0.47	0.18	FALSE
284	MTL	Recent	MN	1975.2004	PrevFall	-0.48	-0.73	-0.14	TRUE
285	MTL	Recent	MN	1975.2004	Winter	-0.54	-0.77	-0.25	TRUE
286	MTL	Recent	MN	1975.2004	Spring	-0.40	-0.67	-0.03	TRUE
287	MTL	Recent	MN	1975.2004	Summer	-0.31	-0.55	-0.02	TRUE
288	MTL	Recent	MN	1975.2004	Fall	0.02	-0.30	0.32	FALSE
289	MTL	Recent	5N	1950.1979	PrSum	-0.16	-0.50	0.18	FALSE
290	MTL	Recent	5N	1950.1979	PrevFall	-0.07	-0.36	0.24	FALSE
291	MTL	Recent	5N	1950.1979	Winter	-0.16	-0.52	0.17	FALSE
292	MTL	Recent	5N	1950.1979	Spring	-0.40	-0.65	-0.03	TRUE
293	MTL	Recent	5N	1950.1979	Summer	0.06	-0.26	0.37	FALSE
294	MTL	Recent	5N	1950.1979	Fall	0.02	-0.28	0.29	FALSE
295	MTL	Recent	5N	1955.1984	PrSum	-0.16	-0.48	0.24	FALSE
296	MTL	Recent	5N	1955.1984	PrevFall	-0.07	-0.39	0.28	FALSE
297	MTL	Recent	5N	1955.1984	Winter	-0.07	-0.41	0.26	FALSE
298	MTL	Recent	5N	1955.1984	Spring	-0.30	-0.58	0.12	FALSE
299	MTL	Recent	5N	1955.1984	Summer	-0.02	-0.32	0.29	FALSE
300	MTL	Recent	5N	1955.1984	Fall	0.14	-0.13	0.42	FALSE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
301	MTL	Recent	5N	1960.1989	PrSum	-0.25	-0.54	0.04	FALSE
302	MTL	Recent	5N	1960.1989	PrevFall	0.01	-0.31	0.35	FALSE
303	MTL	Recent	5N	1960.1989	Winter	-0.01	-0.38	0.35	FALSE
304	MTL	Recent	5N	1960.1989	Spring	-0.20	-0.51	0.22	FALSE
305	MTL	Recent	5N	1960.1989	Summer	-0.14	-0.45	0.20	FALSE
306	MTL	Recent	5N	1960.1989	Fall	0.12	-0.21	0.38	FALSE
307	MTL	Recent	5N	1965.1994	PrSum	-0.11	-0.33	0.13	FALSE
308	MTL	Recent	5N	1965.1994	PrevFall	0.10	-0.25	0.44	FALSE
309	MTL	Recent	5N	1965.1994	Winter	-0.17	-0.49	0.19	FALSE
310	MTL	Recent	5N	1965.1994	Spring	-0.12	-0.49	0.29	FALSE
311	MTL	Recent	5N	1965.1994	Summer	-0.18	-0.46	0.10	FALSE
312	MTL	Recent	5N	1965.1994	Fall	0.09	-0.25	0.40	FALSE
313	MTL	Recent	5N	1970.1999	PrSum	-0.16	-0.47	0.21	FALSE
314	MTL	Recent	5N	1970.1999	PrevFall	-0.19	-0.60	0.27	FALSE
315	MTL	Recent	5N	1970.1999	Winter	-0.29	-0.61	0.04	FALSE
316	MTL	Recent	5N	1970.1999	Spring	-0.26	-0.62	0.22	FALSE
317	MTL	Recent	5N	1970.1999	Summer	-0.21	-0.45	0.05	FALSE
318	MTL	Recent	5N	1970.1999	Fall	0.00	-0.28	0.31	FALSE
319	MTL	Recent	5N	1975.2004	PrSum	-0.29	-0.54	0.01	FALSE
320	MTL	Recent	5N	1975.2004	PrevFall	-0.52	-0.73	-0.18	TRUE

Table S3. (Continued)

	Site	Period	Taxon	Years	Month	Coefficient	Lower_CI	Upper_CI	Significant
321	MTL	Recent	5N	1975.2004	Winter	-0.48	-0.72	-0.16	TRUE
322	MTL	Recent	5N	1975.2004	Spring	-0.45	-0.71	-0.08	TRUE
323	MTL	Recent	5N	1975.2004	Summer	-0.40	-0.61	-0.10	TRUE
324	MTL	Recent	5N	1975.2004	Fall	0.05	-0.28	0.34	FALSE

Two sites [Mt. Bigelow (BIG); Mt. Lemmon (MTL)]; two periods (Early, Recent); three taxa [three-needle (3N), mixed-needle (MN), five-needle (5N)]; six seasons: PrSum=previous summer (July-September); PrevFall=previous fall (October-December); Winter (January-March); Spring (April-June); Summer (July-September); Fall (October-December).

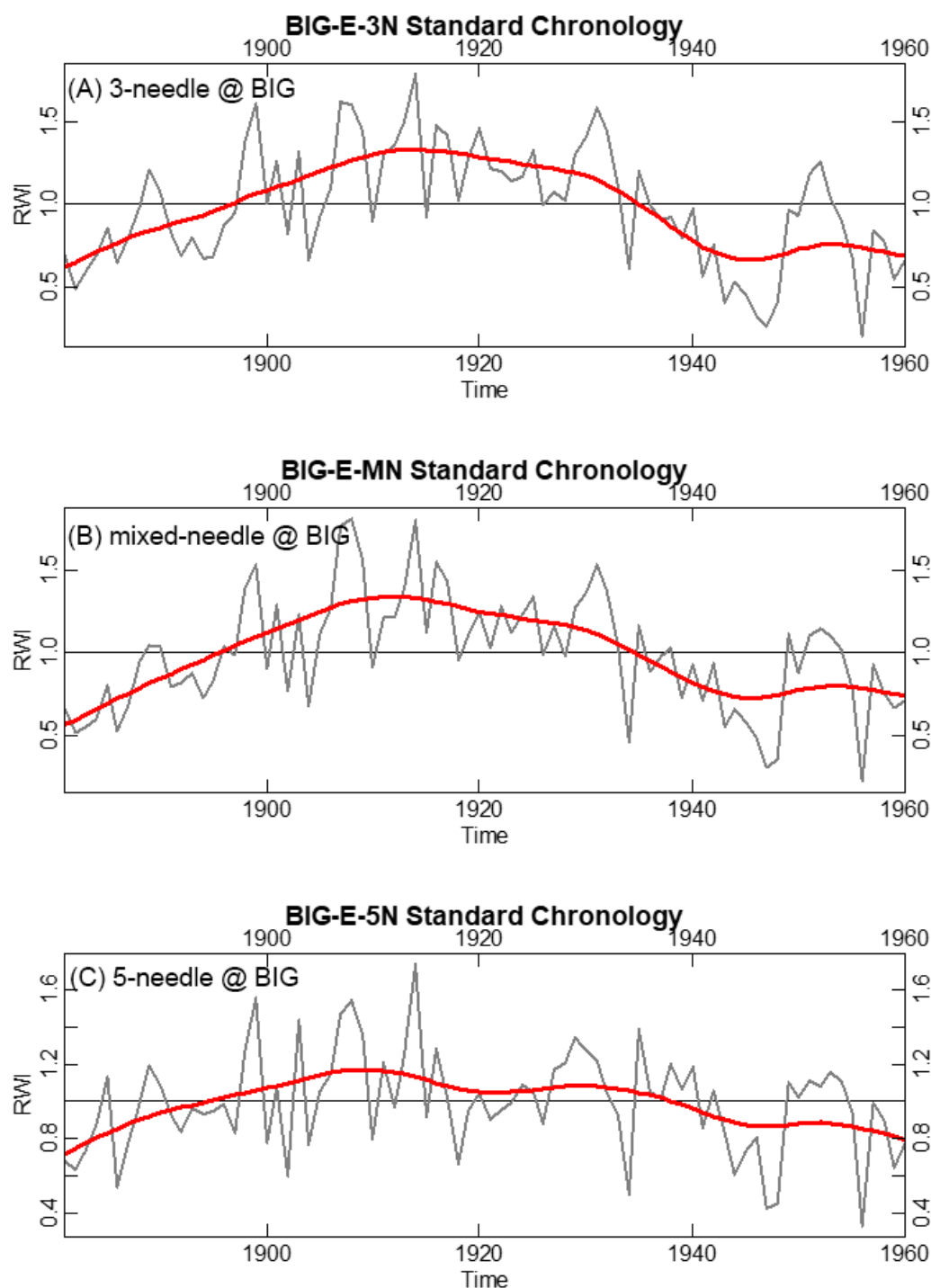


Figure S1. Average yearly standard chronology for three-, mixed-, and five- needle types in the early BIG tree-ring study^{10–11}. Each chronology represents the mean of 12 cores from 6 trees for the reference period of 1881–1960, with period 1891–1949 used for early analysis. Each chronology represents an $\text{EPS} \geq 0.89$ (Appendix A). A = three-needle type, B = mixed-needle type, and C = five-needle type.

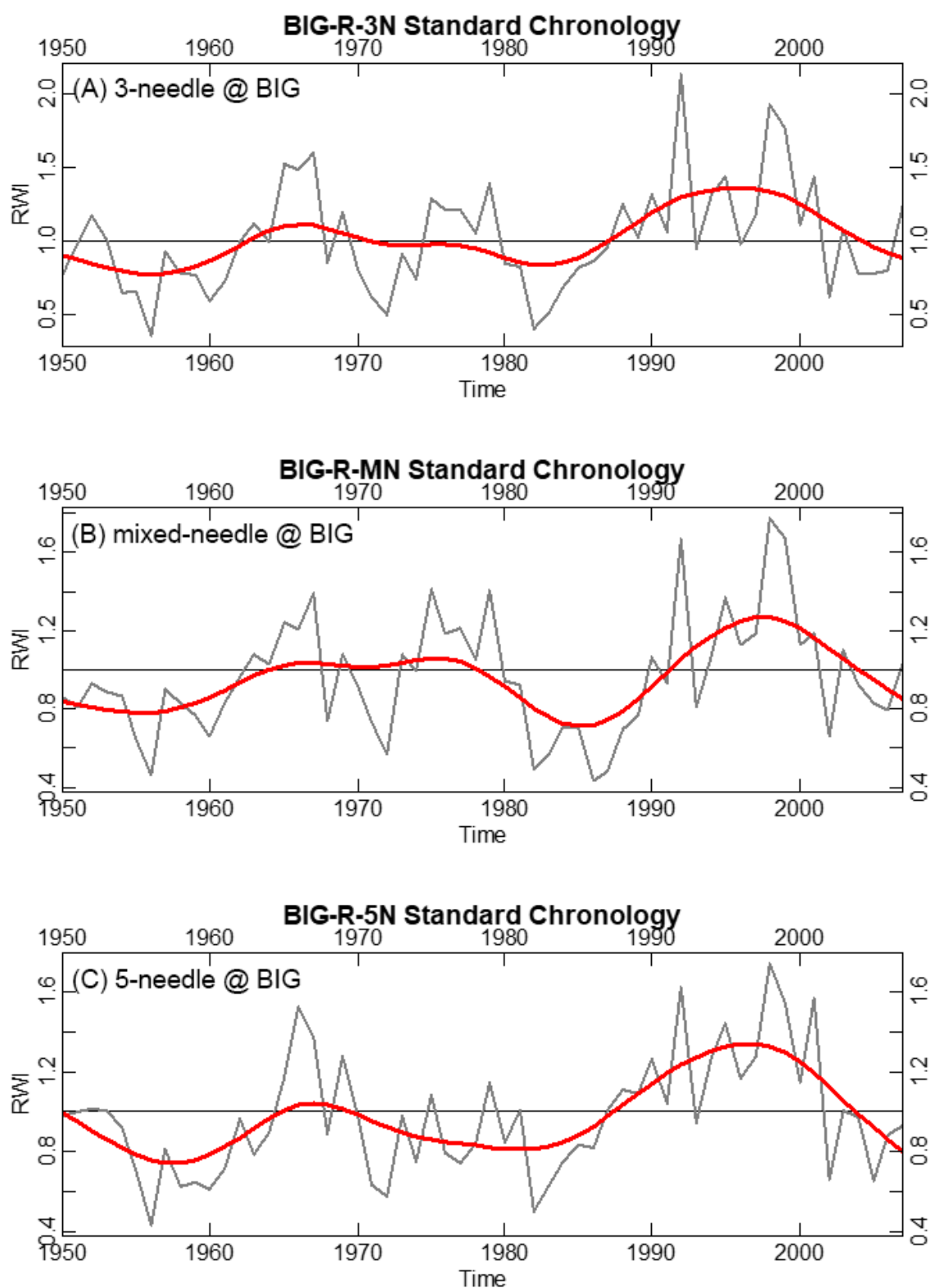


Figure S2. Average yearly standard chronologies for three-, mixed-, and five- needle types in the recent BIG tree-ring study. Each chronology represents an $EPS \geq 0.82$ and sample depth ≥ 12 , for the reference period of 1950–2007. A = three-needle type, B = mixed-needle type, and C = five-needle type.

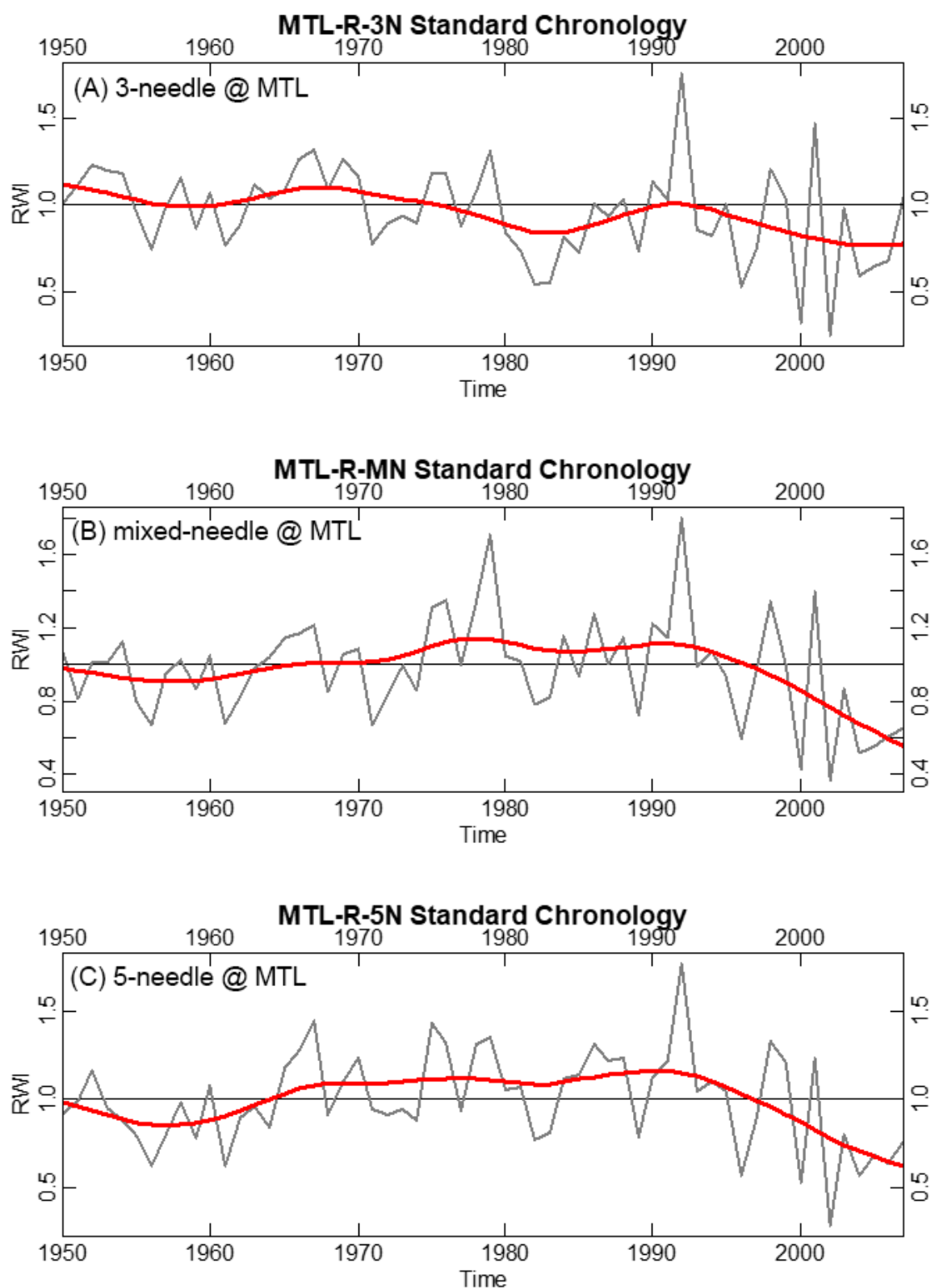


Figure S3. Average yearly standard chronologies for three-, mixed-, and five- needle types in the recent MTL tree-ring study. Each chronology represents an $EPS \geq 0.84$ and sample depth ≥ 15 , for the reference period of 1950–2007. A = three-needle type, B = mixed-needle type, and C = five-needle type.