Supplementary Materials for

**Investigating (a)symmetry in a small mammal’s response to warming and cooling events across western North America over the late Quaternary**

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**This file includes:**

Tables S1–4

**Table S1.** Results for temperature anomaly (relative to 1,000-yr mean) and shifts in 100-yr bins compared to the estimated temperatures during midden formation over the last 25,000 yr using a Kolmogorov-Smirnov (KS Test) and un-paired Wilcoxon Signed-Rank tests. Shifts are calculated in three ways: (Shift1) the difference between the latest recorded temperature and the earliest recorded temperature in each 100-yr bin; (Shift2) the maximum difference for all possible temperatures, regardless of chronology, for each 100-yr bin; (Shift3) maximum from the first differences of the temperatures in each 100-yr bin. Of note, interpretation of results does not differ based on method of calculating shifts.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | | Anomaly | | Shift1 | | Shift2 | | Shift3 | |
| Locality | Window (ka) | N | | KS Test | Wilcoxon Signed-Rank Test | KS Test | Wilcoxon Signed-Rank Test | KS Test | Wilcoxon Signed-Rank Test | KS Test | Wilcoxon Signed-Rank Test |
| All | 25–0 | 163 | | >0.01 | >0.01 | 0.39 | 0.84 | 0.48 | 0.96 | 0.03 | 0.92 |
|  | 5–0 | 104 | | 0.80 | 0.37 | 0.96 | 0.68 | 0.94 | 0.78 | 0.74 | 0.63 |
|  | 6–1 | 80 | | 0.63 | 0.36 | 0.77 | 0.60 | 0.83 | 0.75 | 0.79 | 0.45 |
|  | 7–2 | 52 | | 1.00 | 0.99 | 0.20 | 0.07 | 0.20 | 0.07 | 0.08 | 0.04 |
|  | 8–3 | 34 | | 0.95 | 0.43 | 0.04 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
|  | 9–4 | 16 | | 0.28 | 0.08 | 0.20 | 0.07 | 0.13 | 0.07 | 0.26 | 0.13 |
|  | 10–5 | 14 | | 0.98 | 0.92 | 0.82 | 0.55 | 0.90 | 0.64 | 0.86 | 0.60 |
|  | 11–6 | 11 | | 0.88 | 0.53 | 1.00 | 0.76 | 0.99 | 0.70 | 0.68 | 0.72 |
|  | 12–7 | 17 | | 0.31 | 0.37 | 0.84 | 0.79 | 0.97 | 0.84 | 1.00 | 0.94 |
|  | 13–8 | 19 | | 0.97 | 0.88 | 0.95 | 0.90 | 0.91 | 0.96 | 0.95 | 1.00 |
|  | 14–9 | 21 | | 1.00 | 0.79 | 1.00 | 0.83 | 1.00 | 0.78 | 1.00 | 0.76 |
|  | 15–10 | 17 | | 0.96 | 0.60 | 0.99 | 0.86 | 0.99 | 0.82 | 0.99 | 0.81 |
|  | 16–11 | 16 | | 0.99 | 0.79 | 0.95 | 0.81 | 0.99 | 0.83 | 1.00 | 0.97 |
|  |  |  | | **Anomaly** | | **Shift1** | | **Shift2** | | **Shift3** | |
| Locality | Window (ka) | N | KS Test | | Wilcoxon Signed-Rank Test | KS Test | Wilcoxon Signed-Rank Test | KS Test | Wilcoxon Signed-Rank Test | KS Test | Wilcoxon Signed-Rank Test |
|  | 17–12 | 12 | | 0.79 | 0.97 | 0.94 | 0.91 | 0.92 | 0.88 | 0.95 | 0.75 |
|  | 18–13 | 12 | | 0.55 | 0.80 | 0.65 | 0.66 | 0.85 | 0.76 | 0.80 | 0.55 |
|  | 19–14 | 13 | | 0.47 | 0.53 | 0.98 | 0.98 | 0.98 | 1.00 | 0.99 | 0.92 |
|  | 20–15 | 16 | | 0.17 | 0.45 | 0.94 | 0.78 | 0.96 | 0.93 | 0.95 | 0.81 |
|  | 21–16 | 15 | | 0.08 | 0.16 | 0.48 | 0.36 | 0.52 | 0.42 | 0.44 | 0.31 |
|  | 22–17 | 16 | | 0.66 | 0.60 | 0.64 | 0.36 | 0.69 | 0.43 | 0.66 | 0.34 |
|  | 23–18 | 16 | | 0.69 | 0.66 | 0.76 | 0.37 | 0.76 | 0.37 | 0.68 | 0.38 |
|  | 24–19 | 15 | | 0.71 | 0.35 | 0.52 | 0.34 | 0.52 | 0.34 | 0.36 | 0.36 |
|  | 25–20 | 12 | | 0.21 | 0.10 | 0.72 | 0.62 | 0.72 | 0.62 | 0.76 | 0.81 |
| Northern | 25–0 | 22 | | 0.00 | 0.00 | 0.32 | 0.66 | 0.23 | 0.79 | 0.11 | 0.90 |
|  | 5–0 | 20 | | 0.33 | 0.13 | 0.99 | 0.95 | 0.75 | 0.88 | 0.77 | 0.93 |
|  | 6–1 | 14 | | 0.71 | 0.49 | 0.88 | 0.90 | 0.91 | 0.87 | 0.97 | 0.88 |
|  | 7–2 | 7 | | 0.53 | 0.28 | 0.84 | 0.56 | 0.94 | 0.64 | 0.81 | 0.36 |
|  | 8–3 | 5 | | 0.16 | 0.20 | 0.46 | 0.33 | 0.47 | 0.43 | 0.53 | 0.20 |
|  | 9–4 | 1 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 10–5 | 1 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 11–6 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 12–7 | 1 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 13–8 | 1 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 14–9 | 1 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 15–10 | 1 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 16–11 | 1 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 17–12 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 18–13 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  |  |  | | **Anomaly** | | **Shift1** | | **Shift2** | | **Shift3** | |
| Locality | Window (ka) | N | | KS Test | Wilcoxon Signed-Rank Test | KS Test | Wilcoxon Signed-Rank Test | KS Test | Wilcoxon Signed-Rank Test | KS Test | Wilcoxon Signed-Rank Test |
|  | 19–14 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 20–15 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 21–16 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 22–17 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 23–18 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 24–19 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 25–20 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Middle | 25–0 | 23 | | 0.00 | 0.00 | 0.94 | 0.59 | 0.68 | 0.73 | 0.39 | 0.86 |
|  | 5–0 | 16 | | 0.89 | 0.90 | 0.41 | 0.22 | 0.09 | 0.16 | 0.32 | 0.53 |
|  | 6–1 | 14 | | 0.85 | 0.45 | 0.57 | 0.46 | 0.10 | 0.39 | 0.41 | 0.80 |
|  | 7–2 | 9 | | 0.99 | 0.63 | 0.95 | 0.88 | 0.75 | 0.74 | 0.74 | 0.73 |
|  | 8–3 | 4 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 9–4 | 2 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 10–5 | 3 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 11–6 | 3 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 12–7 | 5 | | 0.60 | 0.41 | 0.99 | 0.78 | 0.95 | 0.71 | 0.98 | 0.98 |
|  | 13–8 | 5 | | 0.98 | 0.95 | 0.99 | 0.78 | 0.97 | 0.66 | 0.99 | 0.98 |
|  | 14–9 | 6 | | 0.86 | 0.77 | 1.00 | 0.91 | 0.98 | 0.68 | 1.00 | 0.96 |
|  | 15–10 | 4 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 16–11 | 3 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 17–12 | 1 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 18–13 | 1 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 19–14 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 20–15 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  |  |  | | **Anomaly** | | **Shift1** | | **Shift2** | | **Shift3** | |
| Locality | Window (ka) | N | | KS Test | Wilcoxon Signed-Rank Test | KS Test | Wilcoxon Signed-Rank Test | KS Test | Wilcoxon Signed-Rank Test | KS Test | Wilcoxon Signed-Rank Test |
|  | 21–16 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 22–17 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 23–18 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 24–19 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 25–20 | 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Southern | 25–0 | 33 | | 0.95 | 0.94 | 0.93 | 0.87 | 0.87 | 0.98 | 0.82 | 0.88 |
|  | 5–0 | 7 | | 0.83 | 0.72 | 0.74 | 0.79 | 0.68 | 0.78 | 0.92 | 0.64 |
|  | 6–1 | 7 | | 0.80 | 0.54 | 0.94 | 0.98 | 0.92 | 1.00 | 0.97 | 0.81 |
|  | 7–2 | 6 | | 0.64 | 0.63 | 0.14 | 0.28 | 0.14 | 0.28 | 0.17 | 0.31 |
|  | 8–3 | 4 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 9–4 | 5 | | 0.92 | 0.76 | 0.60 | 0.63 | 0.90 | 0.70 | 0.87 | 0.91 |
|  | 10–5 | 7 | | 0.90 | 0.42 | 0.76 | 0.36 | 0.81 | 0.29 | 0.72 | 0.39 |
|  | 11–6 | 8 | | 0.91 | 0.51 | 0.74 | 0.34 | 0.80 | 0.29 | 0.82 | 0.57 |
|  | 12–7 | 9 | | 0.95 | 0.67 | 0.91 | 1.00 | 0.91 | 0.94 | 0.91 | 0.67 |
|  | 13–8 | 10 | | 0.53 | 0.28 | 0.81 | 0.90 | 0.76 | 0.94 | 0.81 | 0.91 |
|  | 14–9 | 9 | | 0.66 | 0.39 | 0.91 | 1.00 | 0.91 | 0.99 | 0.91 | 0.98 |
|  | 15–10 | 5 | | 0.98 | 0.58 | 0.60 | 0.49 | 0.59 | 0.53 | 0.60 | 0.73 |
|  | 16–11 | 5 | | 0.98 | 0.63 | 0.60 | 0.48 | 0.58 | 0.60 | 0.61 | 0.74 |
|  | 17–12 | 4 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 18–13 | 4 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 19–14 | 6 | | 0.64 | 0.80 | 0.59 | 0.69 | 0.58 | 0.61 | 0.87 | 0.95 |
|  | 20–15 | 8 | | 0.76 | 0.92 | 0.98 | 0.96 | 0.95 | 0.83 | 0.98 | 0.86 |
|  | 21–16 | 7 | | 0.65 | 0.49 | 0.80 | 0.69 | 0.80 | 0.79 | 0.86 | 0.50 |
|  | 22–17 | 7 | | 0.57 | 0.51 | 0.80 | 0.67 | 0.82 | 0.74 | 0.83 | 0.58 |
|  |  |  | |  |  |  |  |  |  |  |  |
|  |  |  | | **Anomaly** | | **Shift1** | | **Shift2** | | **Shift3** | |
| Locality | Window (ka) | N | | KS Test | Wilcoxon Signed-Rank Test | KS Test | Wilcoxon Signed-Rank Test | KS Test | Wilcoxon Signed-Rank Test | KS Test | Wilcoxon Signed-Rank Test |
|  | 23–18 | 7 | | 0.66 | 0.47 | 0.87 | 0.78 | 0.87 | 0.78 | 0.86 | 0.76 |
|  | 25–20 | 6 | | 0.34 | 0.25 | 0.69 | 0.88 | 0.69 | 0.88 | 0.80 | 0.61 |

**Table S2.** *Neotoma cinerea* fossil localities from 40,000 yr to 10,000 yr and references shown in Figure 1A.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Site Name | Latitude | Longitude | Age Range | Reference(s) |
| Medicine Lodge Creek | 44˚25' | -107˚50' | 11,001–11,011 | (Walker, 1987) |
| Deer Creek Cave | 41˚75' | -115˚37' | 11,680–11,127 | ( Ziegler, 1963; Heaton, 1985) |
| Upper Sloth Cave | 31˚87' | -104˚75' | 13,360–12,939 | ( Van Devender et al., 1975; Logan and Black, 1979; Harris, 1985) |
| Smith Creek Cave | 39˚33' | -114˚08' | 14, 004–10,472 | (Bryan, 1979; Mead et al., 1982; Mead et al., 1992) |
| Marmes Rockshelter | 46˚62' | -118˚20' | 14,170–10,191 | (Gustafson, 1972; Lyman and Livingston, 1983; Sheppard et al., 1987) |
| Danger Cave | 40˚62' | -114˚00' | 15,332–11,779 | ( Jennings, 1957; Madsen, 1980; Scott et al., 1983; Currey et al., 1984; Grayson, 1988) |
| Shelter Cave | 32˚18' | -106˚60' | 15,332–11,417 | ( Stock, 1932; Harris, 1977, 1985; Thompson et al., 1980) |
| Bell Cave | 41˚75' | -105˚37' | 16,048–11,417 | ( Zeimans and Walker, 1974; Walker, 1987) |
| Wilson Butte Cave | 42˚77' | -114˚22' | 17,474–11,341 | ( Gruhn, 1961; Crane and Griffin, 1966; Lundelius et al., 1983) |
| Haystack Cave | 38˚37' | -107˚12' | 18,140–14,008 | (Emslie, 1986) |
| Potosi Mountain Midden 2 | 36˚00' | -115˚38' | 19,625–13,854 | (Mead and Murray, 1991) |
| Connley Cave No. 4 | 43˚25' | -121˚00' | 21,286 –10,305 | (Bedwell, 1973; Grayson, 1979) |
| Site Name | Latitude | Longitude | Age Range | Reference(s) |
| Kokoweef Cave | 35˚42' | -115˚50' | 23,956–11,417 | (Goodwin and Reynolds, 1989; Reynolds et al., 1991) |
| Samwel Cave | 40˚92' | -122˚23' | 25,600–19,603 | (Harris, 1985; Feranec et al., 2007) |
| Crystal Ball Cave | 39˚00' | -113˚00' | 27,608–11,417 | (Heaton, 1985) |
| January Cave | 50˚19' | -114˚52' | 27,721-11,417 | (Burns, 1990) |
| Little Box Elder Cave | 42˚62' | -105˚62' | 28,734–10,421 | (Anderson, 1968; Indeck, 1987; Walker, 1987) |
| Hidden Cave | 39˚37' | -106˚50' | 30,041–11,417 | (Grayson, 1985; Thomas, 1985; Thompson et al., 1986) |
| Conkling Cavern | 32˚25' | -104˚50' | 30,041–11,417 | (Harris, 1977, 1985; Smartt, 1977) |
| Dark Canyon Cave | 32˚25' | -104˚50' | 20,041–24,084 | (Harris, 1977, 1985) |
| Dry Cave | 32˚37' | -104˚48' | 35,407–12,757 | (Harris, 1970, 1980, 1984, 1985, 1987) |

**Table S3.** Midden data used in our study. Analyses were restricted to only include intact indurated middens, and further limited middens to only those with an estimated mean body mass of at least 325g to ensure all populations represent *Neotoma cinerea* and not possibly other *Neotoma* species (Smith et al., 2009). Latitude (Lat.) and Longitude (Long.) of the midden locality are given. Ages designated “0” indicate modern records.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Allen Canyon | UT | 37˚47' | -109˚35' | 2195.00 | 11310.00 | 200.00 | 13,161 | 347 | -13.59 | 1.96 | (Betancourt, 1984) |
| Arco Hills | ID | 43˚39' | -113˚08' | 1926.00 | 2400.00 | 185.00 | 2,451 | 351 | 1.34 | -0.23 | (Smith and Betancourt, 2003) |
| Arco Hills | ID | 43˚39' | -113˚08' | 1926.00 | 3315.00 | 150.00 | 3,550 | 418 | 1.32 | -0.43 | (Smith and Betancourt, 2003) |
| Arco Hills | ID | 43˚39' | -113˚08' | 1926.00 | 3880.00 | 140.00 | 4,299 | 329 | 1.17 | 0.80 | (Smith and Betancourt, 2003) |
| Atlatl Cave | NM | 36˚05' | -107˚59' | 1910.00 | 0.00 | 25.00 | 0 | 419 | N/A | N/A | (Betancourt and Davis, 1984) |
| Atlatl Cave | NM | 36˚05' | -107˚59' | 1910.00 | 1960.00 | 120.00 | 1,907 | 455 | 0.83 | 0.17 | (Betancourt and Davis, 1984) |
| Atlatl Cave | NM | 36˚05' | -107˚59' | 1910.00 | 2780.00 | 120.00 | 2,889 | 396 | 1.20 |  | (Betancourt and Davis, 1984) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Atlatl Cave | NM | 36˚05' | -107˚59' | 1910.00 | 5550.00 | 130.00 | 6,337 | 442 | 0.88 | 0.20 | (Betancourt and Davis, 1984) |
| Atlatl Cave | NM | 36˚05' | -107˚59' | 1910.00 | 8290.00 | 150.00 | 9,274 | 345 | 1.57 | -0.30 | (Betancourt and Davis, 1984) |
| Atlatl Cave | NM | 36˚05' | -107˚59' | 1910.00 | 9460.00 | 160.00 | 10,732 | 479 | -2.48 | 0.43 | (Betancourt and Davis, 1984) |
| Atlatl Cave | NM | 36˚05' | -107˚59' | 1910.00 | 10080.00 | 140.00 | 11,650 | 516 | -8.71 | 7.70 | (Betancourt and Davis, 1984) |
| Beaver Creek Canyon | MT | 46˚47' | -111˚52' | 1169.23 | 192.00 | N/A | 196 | 342 | -0.27 | 0.20 | (Norris, 2006) |
| Beaver Creek Canyon | MT | 46˚47' | -111˚52' | 1169.23 | 356.00 | N/A | 419 | 394 | -0.25 | 0.11 | (Norris, 2006) |
| Beaver Creek Canyon | MT | 46˚47' | -111˚52' | 1169.23 | 1570.00 | N/A | 1,455 | 363 | 0.68 | -0.35 | (Norris, 2006) |
| Bird's Eye Canyon/  Creek | WY | 43˚23' | -108˚05' | 1645.00 | 90.00 | 45.00 | 45 | 491 | N/A | N/A | This study |
| Bison Alcove | UT | 38˚44' | -109˚30' | 1317.00 | 405.00 | 100.00 | 453 | 501 | -0.22 | -0.16 | (Mead et al., 1991) |
| Bison Alcove | UT | 38˚44' | -109˚30' | 1317.00 | 1930.00 | 80.00 | 1,872 | 504 | 0.62 | -0.29 | (Mead et al., 1991) |
| Bison Alcove | UT | 38˚44' | -109˚30' | 1317.00 | 3058.00 | 38.00 | 3,281 | 533 | 2.77 | 0.40 | (Mead et al., 1991) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Bison Alcove | UT | 38˚44' | -109˚30' | 1317.00 | 12420.00 | 210.00 | 14,340 | 513 | -2.91 | -1.72 | (Mead et al., 1991) |
| Bison Alcove | UT | 38˚44' | -109˚30' | 1317.00 | 14910.00 | 100.00 | 17,924 | 565 | -11.73 | -0.26 | (Mead et al., 1991) |
| Bison Alcove | UT | 38˚44' | -109˚30' | 1317.00 | 15250.00 | 100.00 | 18,492 | 597 | -12.48 | 1.31 | (Mead et al., 1991) |
| Bison Alcove | UT | 38˚44' | -109˚30' | 1317.00 | 16490.00 | 170.00 | 19,610 | 607 | -13.49 | 0.28 | (Mead et al., 1991) |
| Bison Alcove | UT | 38˚44' | -109˚30' | 1317.00 | 17910.00 | 110.00 | 21,237 | 543 | -17.75 | 0.45 | (Mead et al., 1991) |
| Bison Alcove | UT | 38˚44' | -109˚30' | 1317.00 | 18480.00 | 100.00 | 22,101 | 542 | -16.63 | -0.53 | (Mead et al., 1991) |
| Bison Alcove | UT | 38˚44' | -109˚30' | 1317.00 | 20050.00 | 160.00 | 23,948 | 560 | -21.25 | 0.24 | (Mead et al., 1991) |
| Bison Alcove | UT | 38˚44' | -109˚30' | 1317.00 | 20680.00 | 140.00 | 24,653 | 582 | -19.53 | 0.00 | (Mead et al., 1991) |
| Brokenback Canyon | WY | 44˚06' | -107˚25' | 1569.23 | 2095.00 | 75.00 | 2,067 | 357 | 1.97 | -0.30 | (Lyford et al., 2003) |
| Brokenback Canyon | WY | 44˚06' | -107˚25' | 1581.00 | 2200.00 | 60.00 | 2,212 | 381 | 1.46 | 0.60 | (Lyford et al., 2003) |
| Brokenback Canyon | WY | 44˚06' | -107˚25' | 1763.08 | 3144.00 | N/A | N/A | 347 | N/A | N/A | (Lyford et al., 2003) |
| Brokenback Canyon | WY | 44˚06' | -107˚25' | 1769.00 | 887.00 | N/A | N/A | 355 | N/A | N/A | (Lyford et al., 2003) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Cook's Canyon | WY | 43˚59' | -107˚14' | 1784.62 | 2695.00 | 75.00 | 2,794 | 446 | 0.95 | -0.42 | This study |
| Cook's Canyon | WY | 43˚59' | -107˚14' | 1895.38 | 4620.00 | 90.00 | 5,336 | 379 | 0.85 | 1.01 | This study |
| Cook's Canyon | WY | 43˚59' | -107˚14' | 1969.23 | 500.00 | 65.00 | 526 | 360 | -0.17 | 0.22 | This study |
| Coyote Hills | NM | N/A | N/A | N/A | 13830.00 | 165.00 | 16,114 | 332 | -13.77 | -0.47 | (Holmgren et al., 2003) |
| CR | UT | N/A | N/A | N/A | 0.00 | N/A | 0 | 372 | N/A | N/A | This study |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2021.00 | 0.00 | 25.00 | 0 | 527 | N/A | N/A | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2029.00 | 0.00 | 25.00 | 0 | 498 | N/A | N/A | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2030.00 | 1495.00 | 60.00 | 1,377 | 537 | 0.11 | -0.54 | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2030.00 | 1985.00 | 50.00 | 1,929 | 345 | 1.06 | -0.95 | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2030.00 | 2255.00 | 50.00 | 2,279 | 409 | 1.19 | -0.63 | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2030.00 | 2945.00 | 70.00 | 3,105 | 415 | 1.28 | -0.90 | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2030.00 | 4650.00 | 85.00 | 5,374 | 392 | 0.46 | 0.86 | (Lyford et al., 2003) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2030.00 | 8455.00 | 75.00 | 9,471 | 440 | 1.41 | 0.30 | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2030.77 | 4100.00 | 60.00 | 4,607 | 344 | 0.26 | 0.61 | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2030.77 | 9100.00 | 70.00 | 10,247 | 329 | 0.29 | 0.77 | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2049.23 | 579.00 | 40.00 | 506 | 414 | -0.16 | -0.18 | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2061.54 | 2170.00 | 70.00 | 2,170 | 375 | 1.68 | 0.32 | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2080.00 | 1990.00 | 70.00 | 1,937 | 355 | 1.11 | -0.86 | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2080 | 410.00 | 50.00 | 474 | 453 | -0.21 | -0.18 | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2080 | 1630.00 | 70.00 | 1,521 | 544 | 0.92 | -0.64 | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2080 | 2610.00 | 50.00 | 2,737 | 575 | 0.87 | 0.39 | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2080 | 2630.00 | 60.00 | 2,747 | 504 | 0.85 | 0.29 | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2080 | 10180.00 | 140.00 | 11,851 | 375 | -15.97 | 1.20 | (Lyford et al., 2003) |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2080 | 35170.00 | 710.00 | 40,494 | N/A | N/A | N/A | (Lyford et al., 2003) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Dutch John Mountain | UT | 40˚57' | -109˚25' | 2080 | 23120.00 | 190.00 | 27,743 | N/A | N/A | N/A | (Lyford et al., 2003) |
| Fishmouth Cave | UT | 37˚25' | -109˚38' | 1520.00 | 0.00 | 25.00 | 0 | 378 | N/A | N/A | (Betancourt, 1984) |
| Fishmouth Cave | UT | 37˚25' | -109˚38' | 1520.00 | 0.00 | 25.00 | 0 | 389 | N/A | N/A | (Betancourt, 1984) |
| Fishmouth Cave | UT | 37˚25' | -109˚38' | 1546.00 | 0.00 | 25.00 | 0 | 333 | N/A | N/A | (Betancourt, 1984) |
| Fishmouth Cave | UT | 37˚25' | -109˚39' | 1585.00 | 3550.00 | 60.00 | 3,839 | 343 | 0.74 | 0.39 | (Betancourt, 1984) |
| Fishmouth Cave | UT | 37˚25' | -109˚39' | 1585.00 | 9700.00 | 110.00 | 11,106 | 342 | -4.40 | 0.65 | (Betancourt, 1984) |
| Fishmouth Cave | UT | 37˚25' | -109˚39' | 1585.00 | 10540.00 | 300.00 | 12,392 | 380 | -16.27 | 0.62 | (Betancourt, 1984) |
| Fishmouth Cave | UT | 37˚25' | -109˚39' | 1585.00 | 12770.00 | 140.00 | 14,873 | 409 | -13.05 | 0.39 | (Betancourt, 1984) |
| Fishmouth Cave | UT | 37˚25' | -109˚39' | 1585.00 | 13800.00 | 320.00 | 16,098 | 480 | -13.74 | -0.47 | (Betancourt, 1984) |
| Hidden Mouth Cave | ID | 43˚57' | -113˚26' | 2255.00 | 3160.00 | 80.00 | 3,379 | 446 | 1.84 | 0.56 | (Smith and Betancourt, 2003) |
| Hidden Mouth Cave | ID | 43˚57' | -113˚26' | 2255.00 | 3555.00 | 85.00 | 3,845 | 456 | 0.74 | 0.39 | (Smith and Betancourt, 2003) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Hidden Mouth Cave | ID | 43˚57' | -113˚26' | 2255.00 | 3985.00 | 85.00 | 4,446 | 468 | 0.36 | 0.44 | (Smith and Betancourt, 2003) |
| Homestead Cave | UT | 41˚00' | -113˚00' | 1406.00 | 1020.00 | 40.00 | 935 | 340 | 0.84 | -0.82 | (Madsen et al., 2001) |
| Homestead Cave | UT | 41˚00' | -113˚00' | 1406.00 | 1200.00 | 50.00 | 1,119 | 341 | 0.28 | 0.69 | (Madsen et al., 2001) |
| Homestead Cave | UT | 41˚00' | -113˚00' | 1406.00 | 2025.00 | 775.00 | 2,009 | 408 | 1.72 | -0.61 | (Madsen et al., 2001) |
| Homestead Cave | UT | 41˚00' | -113˚00' | 1406.00 | 3480.00 | 40.00 | 3,745 | 336 | 1.34 | 0.35 | (Madsen et al., 2001) |
| Homestead Cave | UT | 41˚00' | -113˚00' | 1406.00 | 8675.00 | 235.00 | 9,698 | 399 | 1.84 | -0.06 | (Madsen et al., 2001) |
| Homestead Cave | UT | 41˚00' | -113˚00' | 1406.00 | 10255.00 | 180.00 | 11,989 | 396 | -15.23 | -1.25 | (Madsen et al., 2001) |
| Homestead Cave | UT | 41˚00' | -113˚00' | 1406.00 | 11168.00 | 208.00 | 13,027 | 438 | -9.56 | 0.48 | (Madsen et al., 2001) |
| Inyan Kara Drainage | SD | 44˚49' | -104˚79' | 1280.00 | 153.00 | 36 | 145 | 376 | -0.08 | 0.45 | (Norris et al., 2016) |
| Twin Creek | WY | 42˚40' | -108˚30' | 1876.92 | 380.00 | 80.00 | 436 | 342 | -0.23 | -0.14 | (Lyford et al., 2003) |
| Twin Creek | WY | 42˚40' | -108˚30' | 1886.15 | 100.00 | 0.50 | 150 | 432 | -0.10 | 0.44 | (Lyford et al., 2003) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Twin Creek | WY | 42˚40' | -108˚30' | 1907.69 | 99.30 | 0.74 | 169 | 413 | -0.17 | 0.44 | (Lyford et al., 2003) |
| Twin Creek | WY | 42˚40' | -108˚30' | 1907.69 | 1930.00 | 50.00 | 1,873 | 449 | 0.65 | -0.39 | (Lyford et al., 2003) |
| Little Belt Mountains | MT | 46˚51' | -110˚18' | 1575.38 | 377.00 | N/A | 438 | 339 | -0.23 | -0.14 | (Norris et al., 2016) |
| Little Belt Mountains | MT | 46˚33' | -110˚27' | 1600.00 | 368.00 | N/A | 430 | 380 | -0.24 | -0.14 | (Norris et al., 2016) |
| Lower Canyon Creek | WY | 44˚02' | -107˚20' | 1581.00 | 1280.00 | 50.00 | 1,222 | 361 | -0.35 | -0.28 | (Lyford et al., 2003) |
| Lower Canyon Creek | WY | 44˚02' | -107˚20' | 1581.00 | 1740.00 | 50.00 | 1,650 | 385 | 1.00 | 0.59 | (Lyford et al., 2003) |
| Lower Canyon Creek | WY | 44˚02' | -107˚20' | 1581.00 | 1880.00 | 45.00 | 1,822 | 384 | 0.66 | 0.29 | (Lyford et al., 2003) |
| Lower Canyon Creek | WY | 44˚02' | -107˚20' | 1593.00 | 1635.00 | 70.00 | 1,527 | 377 | 0.96 | -0.56 | (Lyford et al., 2003) |
| Lyman Lake | AZ | 34˚50' | -109˚50' | 1880.00 | 1690.00 | 50.00 | 1,588 | 381 | 0.98 | -0.40 | (Smith and Betancourt, 1998) |
| Lyman Lake | AZ | 34˚50' | -109˚50' | 1880.00 | 3110.00 | 60.00 | 3,334 | 346 | 2.31 | 1.16 | (Smith and Betancourt, 1998) |
| Lyman Lake | AZ | 34˚50' | -109˚50' | 1880.00 | 10020.00 | 70.00 | 11,502 | 426 | -5.12 | -2.16 | (Smith and Betancourt, 1998) |
| Lyman Lake | AZ | 34˚50' | -109˚50' | 1880.00 | 12090.00 | 100.00 | 13,887 | 424 | -7.56 | 0.24 | (Smith and Betancourt, 1998) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Lyman Lake | AZ | 34˚50' | -109˚50' | 1880.00 | 15540.00 | 180.00 | 18,750 | 414 | -11.89 | -0.60 | (Smith and Betancourt, 1998) |
| Lyman Lake | AZ | 34˚50' | -109˚50' | 1880.00 | 16460.00 | 100.00 | 19,574 | 487 | -13.80 | -0.25 | (Smith and Betancourt, 1998) |
| Lyman Lake | AZ | 34˚50' | -109˚50' | 1880.00 | 16480.00 | 90.00 | 19,594 | 466 | -13.48 | -0.25 | (Smith and Betancourt, 1998) |
| Medicine Lodge Canyon | WY | 44˚19' | -107˚32' | 1640.00 | 4810.00 | 90.00 | 5,549 | 349 | 1.23 | -0.87 | (Lyford et al., 2003) |
| Miller Creek | WY | 44˚50' | -104˚70' | 1213 | 795.00 | 32.00 | 709 | 382 | -0.10 | 0.34 | (Norris et al., 2016) |
| Perry Park Golf Course | CO | 39˚26' | -104˚99' | 2011.00 | 210.00 | 50.00 | 230 | 451 | -0.31 | 0.11 | This study |
| Perry Park Golf Course | CO | 39˚26' | -104˚99' | 2011.00 | 1420.00 | 60.00 | 1,320 | 467 | -0.02 | -0.47 | This study |
| Pictograph Cave | ID | 43˚41' | -113˚20' | 1900.00 | 3970.00 | 85.00 | 4,427 | 394 | 0.45 | 0.47 | (Smith and Betancourt, 2003) |
| Pictograph Cave | ID | 43˚41' | -113˚20' | 1900.00 | 4050.00 | 140.00 | 4,539 | 369 | 0.49 | -0.46 | (Smith and Betancourt, 2003) |
| Pryor Mountains | MT | 44˚08' | -108˚38' | 1490.00 | 1785.00 | 80.00 | 1,706 | 419 | 0.77 | 0.52 | (Lyford et al., 2003) |
| Pryor Mountains | MT | 44˚08' | -108˚38' | 1490.00 | 3190.00 | 80.00 | 3,409 | 389 | 1.70 | 0.44 | (Lyford et al., 2003) |
| Pryor Mountains | MT | 45˚07' | -108˚38' | 1500.00 | 490.00 | 70.00 | 521 | 335 | -0.16 | 0.20 | (Lyford et al., 2003) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Pryor Mountains | MT | 44˚08' | -108˚38' | 1518.00 | 1660.00 | 50.00 | 1,510 | 345 | 0.88 | -0.71 | (Lyford et al., 2003) |
| Pryor Mountains | MT | 44˚08' | -108˚38' | 1518.00 | 3285.00 | 75.00 | 3,507 | 357 | 1.29 | 0.30 | (Lyford et al., 2003) |
| Pryor Mountains | MT | 44˚08' | -108˚38' | 1524.00 | 1160.00 | 70.00 | 1,071 | 403 | 0.60 | 0.43 | (Lyford et al., 2003) |
| Pryor Mountains | MT | 44˚08' | -108˚38' | 1554.00 | 2370.00 | 75.00 | 2,393 | 458 | 1.42 | 0.41 | (Lyford et al., 2003) |
| Redbird Canyon | SD | 43˚79' | -104˚02' | 1470.77 | 344.00 | 68.00 | 396 | 439 | N/A | N/A | (Norris et al., 2016) |
| Redbird Canyon | SD | 43˚79' | -104˚02' | 1492.31 | 1090.00 | 38.00 | 999 | 419 | N/A | N/A | (Norris et al., 2016) |
| Redbird Canyon | SD | 43˚79' | -104˚02' | 1520.00 | 196.00 | 68.00 | 179 | 515 | N/A | N/A | (Norris et al., 2016) |
| Redbird Canyon | SD | 43˚81' | -104˚00' | 1560.00 | 0.00 | N/A | 0 | 374 | N/A | N/A | (Norris et al., 2016) |
| Redbird Canyon | SD | 43˚81' | -104˚00' | 1560.00 | 2580.00 | 38.00 | 2,725 | 520 | N/A | N/A | (Norris et al., 2016) |
| Redbird Canyon | SD | 43˚81' | -104˚00' | 1560.00 | 3554.00 | 37.00 | 3,849 | 482 | N/A | N/A | (Norris et al., 2016) |
| Rocky Canyon | ID | 43˚40' | -113˚20' | 1798.00 | 455.00 | 70.00 | 500 | 366 | -0.17 | -0.21 | (Smith and Betancourt, 2003) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Rocky Canyon | ID | 43˚40' | -113˚20' | 1798.00 | 645.00 | 65.00 | 621 | 434 | -0.15 | -0.31 | (Smith and Betancourt, 2003) |
| Rocky Canyon | ID | 43˚40' | -113˚20' | 1798.00 | 795.00 | 65.00 | 713 | 362 | -0.09 | 0.34 | (Smith and Betancourt, 2003) |
| Rocky Canyon | ID | 43˚40' | -113˚20' | 1798.00 | 1950.00 | 75.00 | 1,894 | 332 | 0.77 | -0.76 | (Smith and Betancourt, 2003) |
| Rocky Canyon | ID | 43˚40' | -113˚20' | 1798.00 | 2100.00 | 85.00 | 2,075 | 381 | 1.98 | -0.30 | (Smith and Betancourt, 2003) |
| Rocky Canyon | ID | 43˚40' | -113˚20' | 1798.00 | 2770.00 | 75.00 | 2,864 | 374 | 1.19 | -0.20 | (Smith and Betancourt, 2003) |
| Rocky Canyon | ID | 43˚40' | -113˚20' | 1798.00 | 3180.00 | 80.00 | 3,399 | 435 | 1.76 | 0.45 | (Smith and Betancourt, 2003) |
| Rocky Canyon | ID | 43˚40' | -113˚20' | 1798.00 | 3925.00 | 85.00 | 4,367 | 362 | 0.76 | 0.34 | (Smith and Betancourt, 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1274.00 | 460.00 | 65.00 | 504 | 376 | -0.16 | -0.18 | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1274.00 | 915.00 | 65.00 | 830 | 330 | 0.37 | -0.08 | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1274.00 | 1880.00 | 70.00 | 1,819 | 338 | 0.67 | 0.29 | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1274.00 | 2860.00 | 75.00 | 2,976 | 447 | 1.11 | 0.14 | (Lyford et al., 2002; Lyford et al., 2003) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1274.00 | 3285.00 | 90.00 | 3,509 | 348 | 1.30 | -0.30 | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1311.00 | 1795.00 | 70.00 | 1,718 | 375 | 0.73 | 0.45 | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1311.00 | 3340.00 | 75.00 | 3,571 | 344 | 1.45 | -0.78 | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1372.00 | 1515.00 | 70.00 | 1,398 | 371 | 0.25 | -0.27 | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1372.00 | 9740.00 | 90.00 | 11,162 | 331 | -4.21 | -1.00 | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1402.00 | 1160.00 | 65.00 | 1,070 | 403 | 0.60 | 0.43 | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1402.00 | 1570.00 | 70.00 | 1,454 | 384 | 0.68 | -0.35 | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1402.00 | 4440.00 | 90.00 | 5,057 | 334 | 1.52 | 0.49 | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1524.00 | 1415.00 | 65.00 | 1,317 | 360 | -0.02 | -0.47 | (Lyford et al., 2002; Lyford et al., 2003) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1582.00 | 3180.00 | 60.00 | 3,398 | 368 | 1.76 | 0.45 | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1582.00 | 3210.00 | 80.00 | 3,428 | 390 | 1.64 | 0.37 | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | 1591.00 | 2665.00 | 75.00 | 2,771 | 343 | 0.87 | -0.34 | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | N/A | 450.00 | 50.00 | 501 | 435 | -0.17 | -0.21 | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | N/A | 26720.00 | 250.00 | 32,007 | N/A | N/A | N/A | (Lyford et al., 2002; Lyford et al., 2003) |
| Southern Bighorn Mountains | MT | 45˚02' | -108˚15' | N/A | 27050.00 | 4290.00 | 32,082 | N/A | N/A | N/A | (Lyford et al., 2002; Lyford et al., 2003) |
| T Hill | WY | 43˚39' | -108˚12' | 1440.00 | 18190.00 | 710.00 | 21,629 | 430 | -18.16 | -1.23 | This study |
| T Hill | WY | 43˚39' | -108˚12' | 1440.00 | 18300.00 | 690.00 | 21,767 | 388 | -16.86 | -0.90 | This study |
| Ten Sleep Canyon | WY | 44˚03' | -107˚30' | 1957.00 | 1145.00 |  | 1,054 | 431 | 0.70 | 0.53 | (Lyford et al., 2003) |
| Titus Canyon | CA | 36˚49' | -117˚08' | 582.00 | 2427.00 | 37.00 | 2,523 | 334 | 1.20 | 0.50 | (Smith et al., 2009) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Titus Canyon | CA | 36˚49' | -117˚08' | 582.00 | 10720.00 | 66.00 | 12,697 | 357 | -18.10 | -0.58 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚50' | -114˚04' | 1015.00 | 3781.00 | 42.00 | 4,150 | 420 | 1.34 | 0.18 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚50' | -117˚04' | 1030.00 | 14085.00 | 40.00 | 16,459 | 421 | -14.74 | 0.00 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚50' | -117˚04' | 1030.00 | 14013.00 | 76.00 | 17,261 | 407 | -13.43 | -0.80 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚50' | -117˚04' | 1030.00 | 16768.00 | 96.00 | 19,991 | 529 | -13.90 | -0.61 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚04' | 1114.00 | 19760.00 | 80.00 | 23,612 | 327 | -18.67 | 4.08 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚04' | 1154.00 | 7987.00 | 47.00 | 8,861 | 397 | 2.14 | -0.48 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚04' | 1154.00 | 13273.00 | 73.00 | 15,456 | 342 | -13.70 | -0.16 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚03' | 1190.00 | 11406.00 | 60.00 | 13,255 | 483 | -13.31 | -2.36 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚03' | 1200.00 | 1310.00 | 15.00 | 1,265 | 325 | -0.16 | -0.43 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚03' | 1200.00 | 16340.00 | 50.00 | 19,457 | 404 | -13.51 | -0.35 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚03' | 1200.00 | 17740.00 | 100.00 | 21,004 | 446 | -16.71 | -0.06 | (Smith et al., 2009) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Titus Canyon | CA | 36˚51' | -117˚03' | 1200.00 | 17660.00 | 120.00 | 22,018 | 590 | -17.21 | -0.44 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚03' | 1200.00 | 20020.00 | 120.00 | 23,919 | 503 | -21.17 | -0.08 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚03' | 1200.00 | 20710.00 | 160.00 | 24,701 | 355 | -19.20 | -0.67 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚04' | 1220.00 | 3433.00 | 37.00 | 3,713 | 390 | 1.41 | 0.37 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚04' | 1220.00 | 4116.00 | 39.00 | 4,677 | 371 | 0.10 | 0.37 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚04' | 1249.00 | 24340.00 | 200.00 | 29,116 | 471 | N/A | 0.00 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚04' | 1249.00 | 26080.00 | 230.00 | 31,318 | 549 | N/A | 0.00 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚04' | 1249.00 | 28070.00 | 210.00 | 33,439 | 464 | N/A | 0.00 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚04' | 1249.00 | 28120.00 | 210.00 | 33,491 | 420 | N/A | 0.00 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚04' | 1249.00 | 24340.00 | 200.00 | 29,116 | 471 | N/A | N/A | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚03' | 1250.00 | 15056.00 | 84.00 | 18,274 | 470 | -12.51 | 0.49 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚51' | -117˚03' | 1250.00 | 15331.00 | 84.00 | 18,413 | 456 | -12.39 | 0.00 | (Smith et al., 2009) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Titus Canyon | CA | 36˚51' | -117˚03' | 1250.00 | 15295.00 | 45.00 | 18,544 | 430 | -13.28 | 0.30 | (Smith et al., 2009) |
| Titus Canyon | CA | 36˚5' | -117˚03' | 1345.00 | 21690.00 | 100.00 | 26,100 | 512 | N/A | N/A | (Smith et al., 2009) |
| Upper Titus Canyon | CA | 36˚50' | -117˚03' | 1345.00 | 19400.00 | 120.00 | 23,092 | 532 | -16.91 | 1.69 | (Smith et al., 2009) |
| Upper Titus Canyon | CA | 36˚50' | -117˚03' | 1345.00 | 21690.00 | 100.00 | 26,100 | 512 | N/A | 0.00 | (Smith et al., 2009) |
| Upper Titus Canyon | CA | 36˚50' | -117˚02' | 1400.00 | 10065.00 | 25.00 | 11,618 | 372 | -6.96 | 5.38 | (Smith et al., 2009) |
| Upper Titus Canyon | CA | 36˚49' | -117˚00' | 1559.00 | 8642.00 | 65.00 | 9,628 | 380 | 1.36 | 1.69 | (Smith et al., 2009) |
| Upper Titus Canyon | CA | 36˚49' | -117˚00' | 1559.00 | 8749.00 | 49.00 | 9,751 | 378 | 1.77 | 0.25 | (Smith et al., 2009) |
| Upper Titus Canyon | CA | 36˚49' | -117˚00' | 1576.00 | 7976.00 | 47.00 | 8,849 | 392 | 2.04 | -0.48 | (Smith et al., 2009) |
| Upper Titus Canyon | CA | 36˚49' | -117˚00' | 1576.00 | 8543.00 | 49.00 | 9,522 | 398 | 1.17 | 0.33 | (Smith et al., 2009) |
| Western Bighorn Mountains | WY | 44˚20' | -107˚43' | 1787.69 | 989.00 | N/A | 909 | 338 | 0.64 | -0.88 | (Norris et al., 2016) |
| Western Bighorn Mountains | WY | 44˚19' | -104˚44' | 1840.00 | 972.00 | N/A | 894 | 326 | 0.50 | -0.55 | (Norris et al., 2016) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Western Bighorn Mountains | WY | 44˚22' | -107˚33' | 1855.38 | 1700.00 | 50.00 | 1,600 | 482 | 1.02 | -0.40 | (Lyford et al., 2002; Lyford et al., 2003) |
| Western Bighorn Mountains | WY | 44˚22' | -107˚33' | 1883.08 | 4630.00 | 90.00 | 5,348 | 333 | 0.67 | 1.00 | (Lyford et al., 2002; Lyford et al., 2003) |
| Western Bighorn Mountains | WY | 44˚22' | -107˚33' | 1892.00 | 225.00 | 40.00 | 253 | 400 | -0.30 | -0.09 | (Lyford et al., 2002; Lyford et al., 2003) |
| Western Bighorn Mountains | WY | 44˚22' | -107˚33' | 1892.00 | 1100.00 | 40.00 | 997 | 420 | 1.01 | 0.62 | (Lyford et al., 2002; Lyford et al., 2003) |
| Western Bighorn Mountains | WY | 44˚15' | -107˚37' | 2129.23 | 1997.00 | N/A | N/A | 362 | N/A | N/A | (Lyford et al., 2002; Lyford et al., 2003) |
| Western Bighorn Mountains | WY | 44˚18' | -107˚36' | 2153.85 | 1072.00 | N/A | N/A | 374 | N/A | N/A | (Lyford et al., 2002; Lyford et al., 2003) |
| Western Bighorn Mountains | WY | 44˚18' | -107˚36' | 2154.00 | 921.00 | N/A | N/A | 430 | N/A | N/A | (Lyford et al., 2002; Lyford et al., 2003) |
| Western Bighorn Mountains | WY | 44˚18' | -107˚36' | 2154.00 | 1121.00 | N/A | N/A | 367 | N/A | N/A | (Lyford et al., 2002; Lyford et al., 2003) |
| Western Bighorn Mountains | WY | 44˚18' | -107˚36' | 2209.23 | 2401.00 | N/A | N/A | 384 | N/A | N/A | (Lyford et al., 2002; Lyford et al., 2003) |
| Locality | State | Lat. | Long. | Elev. (m) | 14C | 14C SD | Age1 | Mass est. (g) | Est. Temp. (˚C) | Max. Temp. Shift (˚C) | Collected / Measured By |
| Wind River Canyon | WY | 43˚34' | -108˚12' | 1367.00 | 2750.00 | 75.00 | 2,843 | 407 | 1.16 | -0.33 | (Jackson et al., 2002; Lyford et al., 2003) |
| Wind River Canyon | WY | 43˚34' | -108˚12' | 1416.00 | 2710.00 | 80.00 | 2,807 | 461 | 1.03 | -0.49 | (Jackson et al., 2002; Lyford et al., 2003) |
| Wind River Canyon | WY | 43˚34' | -108˚12' | 1416.00 | 3430.00 | 80.00 | 3,682 | 409 | 1.50 | 0.58 | (Jackson et al., 2002; Lyford et al., 2003) |
| Wind River Canyon | WY | 43˚34' | -108˚12' | 1416.00 | 3590.00 | 60.00 | 3,890 | 344 | 0.60 | 0.18 | (Jackson et al., 2002; Lyford et al., 2003) |
| Wind River Canyon | WY | 43˚34' | -108˚12' | 1421.00 | 1970.00 | 75.00 | 1,915 | 427 | 0.92 | -0.89 | (Jackson et al., 2002; Lyford et al., 2003) |
| Wind River Canyon | WY | 43˚34' | -108˚12' | 1431.00 | 3260.00 | 80.00 | 3,480 | 415 | 1.42 | 0.47 | (Jackson et al., 2002; Lyford et al., 2003) |
| Wind River Canyon | WY | 43˚34' | -108˚12' | 1431.00 | 3590.00 | 80.00 | 3,890 | 372 | 0.60 | 0.18 | (Jackson et al., 2002; Lyford et al., 2003) |
| Wind River Canyon | WY | 43˚34' | -108˚12' | 1455.00 | 375.00 | 45.00 | 442 | 480 | -0.23 | -0.14 | (Jackson et al., 2002; Lyford et al., 2003) |
| Wind River Canyon | WY | 43˚34' | -108˚12'' | 1455.00 | 767.00 | 43.00 | 691 | 460 | -0.06 | 0.31 | (Jackson et al., 2002; Lyford et al., 2003) |

1 Age is in calendar years

**Table S4.** Comparison of different radio-carbon calibration methods on Q1 (Were populations able to cope equally well, as demonstrated by presence, during warmer or cooler temperatures and warming or cooling events over the late Quaternary?) and Q2 (Did the ability of populations to remain extant (persist) vary with position within their modern geographic range?). Bold text indicates a difference between the two methods: Fairbanks (Fairbanks et al., 2005) and IntCal (Reimer et al., 2013).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Temperature Anomaly | | | | Temperature Shift | | | |
|  |  | KS Test | | Wilcoxon Signed-Rank Test | | KS Test | | Wilcoxon Signed-Rank Test | |
| Locality | Window (ka) | Fairbanks | IntCal | Fairbanks | IntCal | Fairbanks | IntCal | Fairbanks | IntCal |
| All | 25–0 | <0.001 | <0.001 | <0.001 | <0.001 | 0.39 | 0.74 | 0.84 | 0.64 |
|  | 5–0 | 0.80 | 1.00 | 0.37 | 0.96 | 0.96 | 0.76 | 0.68 | 0.93 |
|  | 6–1 | 0.63 | 0.79 | 0.36 | 0.64 | 0.77 | 0.76 | 0.60 | 0.99 |
|  | 7–2 | 1.00 | 0.93 | 0.99 | 0.74 | 0.20 | 0.22 | 0.07 | 0.33 |
|  | 8–3 | 0.95 | 0.98 | 0.43 | 0.78 | **0.04** | **0.10** | **0.01** | **0.22** |
|  | 9–4 | 0.28 | 0.74 | 0.08 | 0.33 | 0.20 | 0.67 | 0.07 | 0.25 |
|  | 10–5 | 0.98 | 0.91 | .92- | 0.42 | 0.82 | 0.28 | 0.55 | 0.06 |
|  | 11–6 | 0.88 | 0.97 | 0.53 | 0.83 | 1.00 | 0.98 | **0.76** | **0.02** |
|  | 12–7 | 0.31 | 0.68 | 0.37 | 0.49 | 0.84 | 0.06 | **0.79** | **0.02** |
|  | 13–8 | 0.97 | 0.90 | 0.88 | 0.72 | 0.95 | 0.26 | 0.90 | 0.10 |
|  | 14–9 | 1.00 | 0.66 | 0.79 | 0.48 | 1.00 | 0.45 | 0.83 | 0.24 |
|  | 15–10 | 0.96 | 0.92 | 0.60 | 0.55 | 0.99 | 0.65 | 0.86 | 0.40 |
|  | 16–11 | 0.99 | 0.28 | 0.79 | 0.19 | 0.95 | 0.77 | 0.81 | 0.47 |
|  |  | Temperature Anomaly | | | | Temperature Shift | | | |  |
|  |  | KS Test | | Wilcoxon Signed-Rank Test | | KS Test | | Wilcoxon Signed-Rank Test | |
| Locality | Window (ka) | Fairbanks | IntCal | Fairbanks | IntCal | Fairbanks | IntCal | Fairbanks | IntCal |
|  | 17–12 | 0.79 | 0.43 | 0.97 | 0.28 | 0.95 | 0.71 | 0.91 | 0.62 |
|  | 18–13 | 0.55 | 0.91 | 0.80 | 0.74 | 0.65 | 0.71 | 0.66 | 0.73 |
|  | 19–14 | 0.47 | 0.12 | 0.53 | 0.17 | 0.98 | 0.25 | 0.98 | 0.40 |
|  | 20–15 | 0.17 | 0.64 | 45 | 0.44 | 0.94 | 0.61 | 0.78 | 0.50 |
|  | 21–16 | 0.08 | 0.90 | <0.001 | <0.001 | 0.48 | 1.00 | 0.73 | 0.71 |
|  | 22–17 | 0.66 | 0.67 | 0.60 | 0.55 | 0.64 | 0.81 | 0.36 | 0.55 |
|  | 23–18 | 0.69 | 0.19 | 0.66 | 0.21 | 0.76 | 0.78 | 0.37 | 0.67 |
|  | 24–19 | 0.71 | 0.75 | 0.35 | 0.90 | 0.52 | 0.50 | 0.34 | 0.43 |
|  | 25–20 | 0.21 | 0.56 | 0.10 | 0.35 | 0.72 | 0.68 | 0.62 | 0.83 |
| Northern | 25–0 | <0.001 | <0.001 | 0.001 | <0.001 | 0.32 | 0.76 | 0.66 | 0.52 |
|  | 5–0 | 0.33 | 0.95 | 0.13 | 0.93 | 0.99 | 0.96 | 0.95 | 0.64 |
|  | 6–1 | 0.71 | 0.92 | 0.49 | 0.90 | 0.88 | 0.99 | 0.90 | 0.79 |
|  | 7–2 | 0.53 | 0.23 | 0.28 | 0.08 | 0.84 | 1.00 | 0.56 | 0.91 |
|  | 8–3 | 0.16 | 0.04 | **0.20** | **0.04** | 0.46 | 0.99 | 0.33 | 0.71 |
|  | 9–4 | 0.63 | 0.78 | 0.52 | 0.71 | 0.41 | 0.85 | 0.19 | 0.68 |
|  | 10–5 | 0.78 | 1.00 | 0.71 | 1.00 | 0.41 | 0.79 | 0.19 | 0.59 |
|  | 11–6 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 12–7 | 0.31 | 0.35 | 0.23 | 0.26 | 0.43 | 0.56 | 0.21 | 0.32 |
|  | 13–8 | 0.71 | 0.75 | 0.61 | 0.66 | 0.46 | 0.59 | 0.23 | 0.36 |
|  |  | Temperature Anomaly | | | | Temperature Shift | | | |
|  |  | KS Test | | Wilcoxon Signed-Rank Test | | KS Test | | Wilcoxon Signed-Rank Test | |
| Locality | Window (ka) | Fairbanks | IntCal | Fairbanks | IntCal | Fairbanks | IntCal | Fairbanks | IntCal |
| All | 14–9 | 0.94 | 0.90 | 0.92 | 0.87 | 0.56 | 0.62 | 0.32 | 0.40 |
|  | 15–10 | 0.67 | 0.63 | 0.56 | 0.52 | 0.55 | 0.67 | 0.43 | 0.56 |
|  | 16–11 | 0.27 | 0.24 | 0.21 | 0.19 | 0.69 | 0.76 | 0.48 | 0.56 |
|  | 17–12 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 18–13 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 19–14 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 20–15 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 21–16 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 22–17 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 23–18 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 24–19 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 25–20 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Central | 25–0 | <0.001 | <0.001 | 0.002 | <0.001 | 0.94 | 0.80 | 0.59 | 0.50 |
|  | 5–0 | 0.89 | 0.42 | 0.90 | 0.84 | 0.41 | 0.98 | 0.22 | 0.55 |
|  | 6–1 | 0.85 | 0.08 | 0.45 | 0.21 | 0.57 | 0.99 | 0.46 | 0.74 |
|  | 7–2 | 0.99 | 0.11 | 0.62 | 0.33 | 0.95 | 0.92 | 0.88 | 0.54 |
|  | 8–3 | 0.37 | 0.16 | 0.16 | 0.35 | 0.84 | 0.47 | 0.57 | 0.61 |
|  | 9–4 | 0.05 | 0.38 | 0.07 | 0.48 | 0.15 | 0.96 | 0.07 | 0.80 |
|  | 10–5 | 0.98 | 0.99 | 0.83 | 0.99 | 0.59 | 0.11 | 0.21 | 0.08 |
|  |  | Temperature Anomaly | | | | Temperature Shift | | | |
|  |  | KS Test | | Wilcoxon Signed-Rank Test | | KS Test | | Wilcoxon Signed-Rank Test | |
| Locality | Window (ka) | Fairbanks | IntCal | Fairbanks | IntCal | Fairbanks | IntCal | Fairbanks | IntCal |
|  | 11–6 | 0.99 | 0.95 | 0.89 | 0.92 | 0.81 | 0.08 | 0.33 | 0.05 |
|  | 12–7 | 0.60 | 0.99 | 0.41 | 0.98 | 0.99 | 0.09 | 0.78 | 0.11 |
|  | 13–8 | 0.98 | 0.38 | 0.95 | 0.31 | 0.99 | 0.12 | 0.78 | 0.15 |
|  | 14–9 | 0.86 | 0.14 | 0.77 | 0.15 | **1.00** | **0.05** | 0.91 | 0.09 |
|  | 15–10 | 0.81 | 0.25 | 0.60 | 0.36 | 0.98 | 0.17 | 0.95 | 0.23 |
|  | 16–11 | 0.62 | 0.46 | 0.32 | 0.22 | 0.93 | 0.79 | 0.88 | 0.59 |
|  | 17–12 | **0.51** | **N/A** | **0.40** | **N/A** | **0.90** | **N/A** | **0.81** | **N/A** |
|  | 18–13 | **0.51** | **N/A** | **0.40** | **N/A** | **0.87** | **N/A** | **0.76** | **N/A** |
|  | 19–14 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 20–15 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 21–16 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 22–17 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 23–18 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 24–19 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 25–20 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Southern | 25–0 | 0.95 | 0.43 | 0.94 | 0.33 | 0.43 | 0.50 | 0.95 | 0.27 |
|  | 5–0 | 0.83 | 0.11 | 0.72 | 0.23 | 0.93 | 0.97 | 0.66 | 0.63 |
|  | 6–1 | 0.80 | 0.54 | 0.54 | 0.80 | 0.79 | 0.82 | 0.55 | 0.55 |
|  | 7–2 | 0.64 | 0.75 | 0.63 | 0.73 | 0.79 | 0.75 | 0.09 | 0.63 |
|  |  | Temperature Anomaly | | | | Temperature Shift | | | |
|  |  | KS Test | | Wilcoxon Signed-Rank Test | | KS Test | | Wilcoxon Signed-Rank Test | |
| Locality | Window (ka) | Fairbanks | IntCal | Fairbanks | IntCal | Fairbanks | IntCal | Fairbanks | IntCal |
|  | 8–3 | 0.65 | 0.67 | 0.47 | 0.23 | **0.05** | **0.72** | **0.01** | **0.24** |
|  | 9–4 | 0.92 | 0.41 | 0.76 | 0.11 | 0.20 | 0.56 | 0.07 | 0.32 |
|  | 10–5 | 0.90 | 0.82 | 0.42 | 0.28 | 0.82 | 0.34 | 0.55 | 0.14 |
|  | 11–6 | 0.91 | 0.97 | 0.51 | 0.72 | 1.00 | 0.42 | 0.76 | 0.08 |
|  | 12–7 | 0.95 | 0.88 | 0.67 | 0.98 | 0.98 | 0.31 | 0.95 | 0.07 |
|  | 13–8 | 0.53 | 0.68 | 0.28 | 0.59 | 1.00 | 0.42 | 0.86 | 0.22 |
|  | 14–9 | 0.66 | 0.74 | 0.39 | 0.56 | 1.00 | 0.86 | 0.61 | 0.38 |
|  | 15–10 | 0.98 | 0.48 | 0.58 | 0.76 | 0.99 | 0.35 | 0.59 | 0.,44 |
|  | 16–11 | 0.98 | 0.10 | 0.63 | 0.40 | 0.89 | 0.40 | 0.59 | 0.50 |
|  | 17–12 | 0.41 | 0.25 | 0.30 | 0.45 | 1.00 | 0.40 | 0.87 | 0.43 |
|  | 18–13 | 0.23 | 0.78 | 0.37 | 0.88 | 0.82 | 0.82 | 0.55 | 0.89 |
|  | 19–14 | 0.64 | 0.70 | 0.80 | 0.49 | 0.96 | 0.65 | 0.85 | 0.58 |
|  | 20–15 | 0.76 | 0.70 | 0.92 | 0.69 | 1.00 | 0.96 | 0.84 | 0.66 |
|  | 21–16 | 0.65 | 0.89 | 0.02 | 0.01 | 0.87 | 0.92 | 0.91 | 0.55 |
|  | 22–17 | 0.57 | 0.76 | 0.51 | 0.96 | 0.88 | 0.40 | 0.60 | 0.35 |
|  | 23–18 | 0.66 | 0.52 | 0.47 | 0.57 | 0.95 | 0.64 | 0.64 | 0.78 |
|  | 24–19 | 0.66 | 0.54 | 0.33 | 0.63 | 0.85 | 0.69 | 0.55 | 0.75 |
|  | 25–20 | 0.34 | 0.92 | 0.25 | 0.99 | 0.72 | 0.87 | 0.62 | 0.75 |

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