**Table S1** Number of individuals sampled for all study species in the chamberless control plots, control chambers, and heated chambers in 2011 and 2013. Chambers with individuals present that did not flower are denoted with “0”. Species codes: ACRU, *Acer rubrum*; CATO, *Carya tomentosa*; QUAL, *Quercus alba*; QURU, *Quercus rubra*; VAPA, *Vaccinium pallidum*; VAST, *Vaccinium stamineum*, CHMA, *Chimaphila maculata*; HEAR, *Hexastylis arifolia*; HIVE, *Hieracium venosum*; THTH, *Thalictrum thalictroides*; TIDI, *Tipularia discolor*.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Leafing |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Chamber *T*** | **ACRU** | | **CATO** | | **QUAL** | | **QURU** | | **VAPA** | | **VAST** | |  |  |
| **2011** | **2013** | **2011** | **2013** | **2011** | **2013** | **2011** | **2013** | **2011** | **2013** | **2011** | **2013** |  |  |
| Ambient | 7 | 10 | 10 | 11 | 7 |  | 6 | 3 | 4 | 10 | 8 | 10 |  |  |
| +0 | 10 | 9 | 2 | 1 | 10 | 10 |  |  | 1 |  | 7 | 5 |  |  |
| +0 | 5 | 4 | 2 | 1 | 10 | 11 | 1 | 1 | 10 | 8 | 6 | 8 |  |  |
| +0 | 10 | 10 | 4 | 6 | 11 | 10 | 1 | 1 | 5 | 10 | 1 |  |  |  |
| +1.5 | 11 | 10 | 8 | 8 | 10 | 10 | 1 | 1 | 9 | 4 | 2 | 7 |  |  |
| +2.0 | 10 | 10 | 4 | 6 | 10 | 10 | 1 | 1 |  |  | 10 | 10 |  |  |
| +2.5 | 1 | 4 | 1 | 1 | 11 | 10 | 1 | 1 | 10 | 10 | 2 | 5 |  |  |
| +3.0 | 2 | 6 | 3 | 4 | 10 | 10 | 1 | 1 | 11 | 10 |  | 1 |  |  |
| +3.5 | 10 | 10 | 1 | 4 | 10 | 10 |  |  |  |  |  |  |  |  |
| +4.0 | 10 | 10 | 8 | 12 | 9 | 9 | 1 | 3 | 10 | 10 | 5 | 7 |  |  |
| +4.5 | 10 | 10 |  |  | 11 | 10 |  |  | 9 | 4 | 2 |  |  |  |
| +5.0 | 10 | 9 | 6 | 5 | 10 | 11 | 1 | 1 | 1 |  |  |  |  |  |
| +5.5 | 2 | 3 | 2 | 3 | 10 | 11 | 1 | 2 | 11 | 9 |  |  |  |  |
| Total | 203 | | 113 | | 251 | | 30 | | 156 | | 96 | |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Flowering | |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Chamber *T*** | **CHMA** | | **HEAR** | | **HIVE** | | **THTH** | | **TIDI** | | **VAPA** | | **VAST** | |
| **2011** | **2013** | **2011** | **2013** | **2011** | **2013** | **2011** | **2013** | **2011** | **2013** | **2011** | **2013** | **2011** | **2013** |
| Ambient | 4 | 9 |  |  | 12 | 10 | 8 | 10 | 11 | 9 | 8 | 10 | 10 | 10 |
| +0 | 0 | 0 | 0 | 0 |  |  |  |  | 0 | 1 |  |  | 0 | 0 |
| +0 | 1 | 1 | 2 | 3 |  |  |  |  |  |  | 0 | 3 | 2 | 1 |
| +0 |  |  | 0 | 2 |  |  |  |  | 0 | 5 | 1 | 6 |  |  |
| +1.5 | 0 | 1 | 1 | 1 | 1 | 2 | 4 | 3 | 0 | 1 | 1 | 1 | 2 | 2 |
| +2.0 | 0 | 0 | 1 | 2 | 1 | 2 | 6 | 5 | 0 | 0 |  |  | 10 | 9 |
| +2.5 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 4 | 5 | 0 | 4 | 0 | 2 |
| +3.0 | 0 | 1 | 0 | 1 |  |  |  |  | 1 | 6 | 3 | 10 |  |  |
| +3.5 | 0 | 0 | 0 | 0 |  |  |  |  |  |  |  |  |  |  |
| +4.0 | 2 | 0 | 0 | 0 | 4 | 3 |  |  | 0 | 8 | 0 | 0 | 3 | 5 |
| +4.5 | 1 | 0 | 1 | 0 |  |  |  |  | 0 | 4 | 0 | 0 | 0 | 0 |
| +5.0 |  |  | 0 | 0 | 3 | 0 | 5 | 4 |  |  |  |  | 0 | 0 |
| +5.5 |  |  | 0 | 0 |  |  |  |  |  |  | 0 | 0 | 0 | 0 |
| Total | 22 | | 16 | | 38 | | 48 | | 55 | | 47 | | 56 | |

**Table S2** Mean phenological sensitivity to air temperature (change in budburst date per °C, ±SE) for six species in Duke Forest, NC in both study years. Chamber temperature is mean air temperature (15 Feb−15 Mar) in °C above ambient. Positive sensitivities indicate that budburst is delayed with warming, whereas negative sensitivities indicate that budburst is advanced with warming. Sample sizes ranged from 1–12 plants per chamber. Asterisks denote significant mean differences between heated plants and control plants: \* *p*<0.05; \*\* *p*<0.01; \*\*\* *p*<0.001.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | |  |  | |  | |  | |  | |
| **Year** | **Chamber Air *T* (°C)** | **Budburst ( Days per °C)** | | | | | | | | | | |
| ***C. tomentosa*** | ***Q. alba*** | | | ***Q. rubra*** | | ***A. rubrum*** | | ***V. pallidum*** | | ***V. stamineum*** |
|
| 2011 | +1.2 | +5.5 ± 2.4 | –0.1 ± 0.2 | | | –5.6 | | –3.2 ± 0.8 | | –1.5 ± 1.3 | | –3.4 ± 1.6 |
| 2011 | +1.2 | +0.4 ± 3.0 | –1.8 ± 1.0 | | | –12.2 | | –2.3 ± 0.3 | |  | | –7.5 ± 0.3 |
| 2011 | +1.4 | +4.9 | +1.7 ± 0.9 | | | +1.5 | | –3.7 | | –1.5 ± 0.9 | | +4.8 ± 0 |
| 2011 | +2.2 | +0.1 ± 1.8 | –0.8 ± 0.8 | | | –6.9 | | –1.0 ± 0.5 | | –1.2 ± 0.2 | |  |
| 2011 | +2.3 | +2.6 | +0.5 ± 0.2 | | |  | | +1.7 ± 0.8 | |  | |  |
| 2011 | +2.9 | –0.4 ± 0.6 | –0.1 ± 0.4 | | | –2.0 | | –1.3 ± 0.7 | | +0.5 ± 0.8 | | +0.1 ± 0.6 |
| 2011 | +3.2 |  | +0.7 ± 0.6 | | |  | | –0.7 ± 0.3 | | –0.7 ± 0.7 | | –2.0 ± 0 |
| 2011 | +4.0 | –0.2 ± 0.6 | –1.3 ± 0.4 | | | –3.5 | | –0.3 ± 0.1 | | –1.3 | |  |
| 2011 | +5.0 | –1.4 ± 0 | –0.6 ± 0.2 | | | –0.4 | | –0.3 ± 0.1 | | –0.3 ± 0.3 | |  |
| 2011 | Mean | +1.4 | –0.2 | | | –4.2 | | –1.2 | | –0.9 \* | | –1.6 |
| 2013 | +0.6 | –2.5 ± 0.9 | –2.6 ± 2.5 | | | +9.1 | | –8.0 ± 2.8 | | +10.5 ± 0.9 | | –3.5 ± 1.5 |
| 2013 | +1.4 | –3.4 | –0.7 ± 1.1 | | | +1.3 | | –4.3 ± 4.0 | | +1.8 ± 1.3 | | +1.9 ± 0.4 |
| 2013 | +1.6 | –3.1 ± 1.1 | –5.0 ± 0.5 | | | –1.0 | | –2.1 ± 1.0 | |  | | –3.9 ± 0 |
| 2013 | +1.7 | –1.5 ± 0.4 | –1.9 ± 0.9 | | | –3.4 | | –3.0 ± 1.4 | | +1.7 ± 0.5 | | +0.4 |
| 2013 | +2.3 | –1.0 ± 0.3 | –1.1 ± 0.9 | | |  | | +0.4 ± 0.4 | |  | |  |
| 2013 | +2.8 | –2.4 ± 0.6 | –1.6 ± 0.7 | | | –0.4 ± 0.8 | | –0.9 ± 0.7 | | +1.2 ± 0.3 | | +0.8 ± 0.3 |
| 2013 | +3.2 |  | –0.7 ± 0.5 | | |  | | +1.1 ± 0.2 | | +1.0 ± 0.8 | |  |
| 2013 | +3.7 | –1.3 ± 0.5 | –2.3 ± 0.5 | | | –2.3 | | –0.3 ± 0.3 | |  | |  |
| 2013 | +4.4 | –1.2 ± 0.3 | –2.5 ± 0.5 | | | –1.7 ± 1.4 | | –0.9 ± 0.3 | | –0.7 ± 0.7 | |  |
| 2013 | Mean | –2.0 \*\*\* | –2.0 \*\* | | | +0.2 | | –2.1 | | +2.6 | | –0.9 |



**Fig. S1** The relationship between target temperature and mean 15 Feb–15 Mar air temperature (°C above ambient) for the twelve experimental chambers in Duke Forest, NC in 2011 (black circles) and 2013 (gray circles). Mean 15 Feb–15 Mar air temperature of control chambers was about 0.5–0.9 °C above ambient temperature, so all warming treatments were calculated relative to control chambers to account for this small chamber effect.



**Fig. S2** The relationship between mean air temperature (15 Feb–15 Mar) and mean (a) soil temperature (°C), (b) relative extractable soil water content (REW), (c) relative humidity (%), and (d) daytime PAR (from 10 to 15 h, μmol m-2 s-1) inside the twelve experimental chambers in 2011 (black circles) and 2013 (gray circles). The RH sensor for the hottest chamber malfunctioned in 2013 and was omitted from panel (c). Warming effects on chamber microenvironment were tested using linear regression for all parameters.



**Fig. S3** The effect of air temperature (15 Feb–15 Mar) on day of budburst in 2011 (black circles) and 2013 (gray circles) for (a-c) ring-porous and (d-f) diffuse-porous species. Points represent individual chamber means. The best-fitting model as determined by AIC (see Table 2) was used to determine trendlines for each species. For diffuse-porous species (d-f), the best-fit model had only year as a predictor, so horizontal lines represent mean flowering date in 2011 (solid line) and 2013 (dashed line).