Supplementary Material: Differences in traits predict phenological responses to daylength more than temperature

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Figures

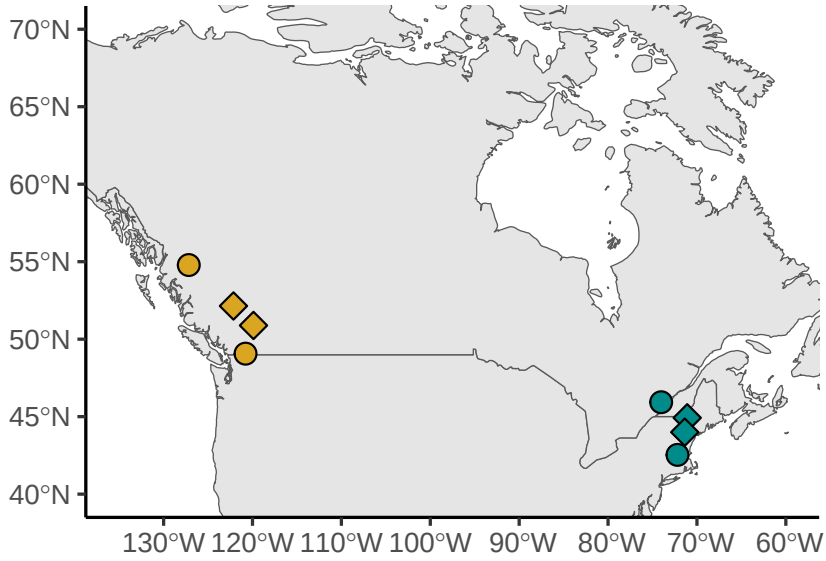

Figure S1: We measured leaf and structural traits in eight temperate deciduous forests, spanning four eastern communities shown in blue and four western communities shown in yellow, across a latitudinal gradients of 4-6°. The branch clippings used in our two growth chamber experiments were taken from the most northern and most southern populations in each transect, as represented by the circles.

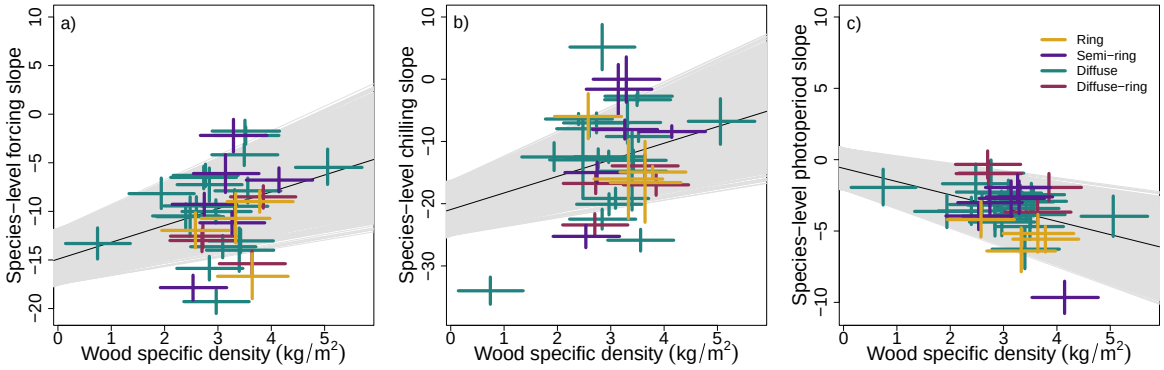

Figure S2: Despite previous studies finding relationships between leaf out timing and species wood xylem structures, we did not find clear differences in species-level estimates of cue responses with wood structure or relative to their wood specific densities. Each cross represents the 50% uncertainty interval of **a**. forcing, **b.** chilling, and **c.** photoperiod responses and WSD, with colors depicting different types of wood structure.

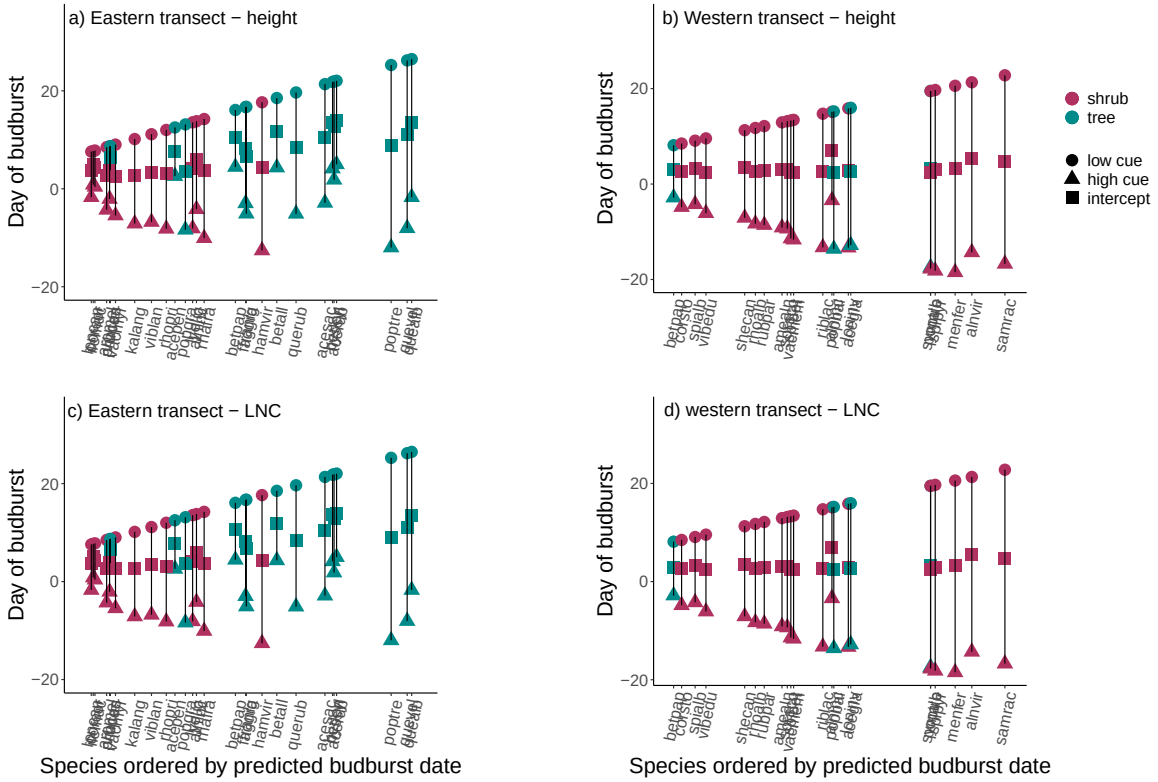

Figure S3: We found the estimated day of budburst differed between our full model (intercept plus cues, depicted as triangles for high cues and as circles for low cues), versus the intercepts only model (without cues, shown as squares). Species are ordered in increasing budburst dates for both the **a** & **c** eastern **b** & **d** and western populations, and in general span from early budbursting shrubs shown in red, to late budbursting trees shown in blue. **a** & **b** For traits such as height we found distinct partitioning of budburst across shrub and tree species, but this was not the case for all traits,**c** & **d** with the ranked order of species in our model of leaf nitrogen content exhibiting a highly mixed budburst order for our shrub and tree species.

Tables

Table S1: Summary output from a joint Bayesian model of height and budburst phenology in which species are partially pooled. The effect of transect is modeled as a dummy variable and latitude as continuous, with an interaction term between latitude and transect. The model includes environmental cues as z-scored continuous variables, allowing comparisons to be made across cues.

	mean	5%	25%	75%	95%
Transect	7.58	-1.08	4.05	11.08	16.16
Latitude	0.05	-0.03	0.02	0.08	0.12
Transect x latitude	-0.20	-0.39	-0.28	-0.12	-0.01
Forcing	-10.31	-12.59	-11.09	-9.41	-8.35
Chilling	-13.44	-17.22	-14.81	-11.99	-9.89
Photoperiod	-2.54	-4.03	-3.20	-1.94	-0.81
Trait x forcing	0.28	-0.07	0.14	0.42	0.61
Trait x chilling	0.25	-0.46	-0.04	0.54	0.96
Trait x photoperiod	-0.34	-0.52	-0.41	-0.27	-0.16

Table S2: Summary output from a joint Bayesian model of DBH and budburst phenology in which species are partially pooled. The effect of transect is modeled as a dummy variable and latitude as continuous, with an interaction term between latitude and transect. The model includes environmental cues as z-scored continuous variables, allowing comparisons to be made across cues

	mean	5%	25%	75%	95%
Transect	-24.13	-42.56	-31.70	-16.66	-5.88
Latitude	0.16	0.00	0.09	0.22	0.31
Transect x latitude	0.52	0.11	0.35	0.68	0.92
Forcing	-9.14	-11.41	-10.07	-8.30	-6.53
Chilling	-12.52	-16.21	-14.03	-11.12	-8.55
Photoperiod	-3.79	-5.68	-4.46	-3.08	-2.01
Trait x forcing	0.20	-0.06	0.09	0.30	0.46
Trait x chilling	0.16	-0.34	-0.04	0.37	0.65
Trait x photoperiod	-0.20	-0.34	-0.26	-0.15	-0.07

Table S3: Summary output from a joint Bayesian model of wood specific density and budburst phenology in which species are partially pooled. The effect of transect is modeled as a dummy variable and latitude as continuous, with an interaction term between latitude and transect. The model includes environmental cues as z-scored continuous variables, allowing comparisons to be made across cues.

	mean	5%	25%	75%	95%
Transect	7.24	4.42	6.04	8.42	10.01
Latitude	0.04	0.01	0.02	0.05	0.06
Transect x latitude	-0.15	-0.21	-0.17	-0.12	-0.09
Forcing	-14.91	-22.87	-17.59	-11.74	-8.63
Chilling	-20.94	-33.15	-25.21	-16.26	-9.75
Photoperiod	-0.61	-4.12	-2.14	0.82	3.30
Trait x forcing	1.73	-0.26	0.89	2.53	3.75
Trait x chilling	2.66	-0.94	1.32	4.04	6.11
Trait x photoperiod	-0.93	-1.99	-1.38	-0.51	0.19

Table S4: Summary output from a joint Bayesian model of LMA and budburst phenology in which species are partially pooled. The effect of transect is modeled as a dummy variable and latitude as continuous, with an interaction term between latitude and transect. The model includes environmental cues as z-scored continuous variables, allowing comparisons to be made across cues.

	mean	5%	25%	75%	95%
Transect	-22.04	-26.60	-23.92	-20.18	-17.51
Latitude	-0.15	-0.20	-0.17	-0.14	-0.11
Transect x latitude	0.48	0.38	0.44	0.52	0.58
Forcing	-2.68	-19.52	-9.07	4.01	13.94
Chilling	-2.67	-30.26	-13.87	8.06	26.04
Photoperiod	-13.97	-23.12	-18.10	-10.12	-3.54
Trait x forcing	-0.59	-1.97	-1.15	-0.04	0.83
Trait x chilling	-0.87	-3.29	-1.80	0.09	1.43
Trait x photoperiod	0.89	0.01	0.57	1.24	1.65

Table S5: Summary output from a joint Bayesian model of LNC and budburst phenology in which species are partially pooled. The effect of transect is modeled as a dummy variable and latitude as continuous, with an interaction term between latitude and transect. The model includes environmental cues as z-scored continuous variables, allowing comparisons to be made across cues.

	mean	5%	25%	75%	95%
Transect	-4.71	-12.82	-8.03	-1.40	3.24
Latitude	-0.14	-0.21	-0.17	-0.11	-0.06
Transect x latitude	0.04	-0.13	-0.03	0.11	0.22
Forcing	-14.43	-32.60	-21.41	-7.56	3.76
Chilling	-35.11	-68.11	-47.92	-22.15	-4.07
Photoperiod	6.39	-2.39	2.55	9.84	16.53
Trait x forcing	0.45	-1.26	-0.19	1.13	2.04
Trait x chilling	2.07	-0.81	0.96	3.24	4.82
Trait x photoperiod	-0.91	-1.69	-1.22	-0.61	-0.11