

Supplemental materials: False spring damage on temperate tree seedlings is amplified with winter warming

Authors:

C. J. Chamberlain^{1,2}, K. Woodruff¹ & E. M. Wolkovich^{1,2,3}

Author affiliations:

¹Arnold Arboretum of Harvard University, 1300 Centre Street, Boston, Massachusetts, USA 02131;

²Organismic & Evolutionary Biology, Harvard University, 26 Oxford Street, Cambridge, Massachusetts, USA 02138;

³Forest & Conservation Sciences, Faculty of Forestry, University of British Columbia, 2424 Main Mall, Vancouver, BC V6T 1Z4

*Corresponding author: 248.953.0189; cchamberlain@g.harvard.edu

Supplemental Materials and Methods: Data analysis and model equations

False spring treatment is written as ‘tx’ in the equation below and chilling was split into two binary predictors: ‘chill1’, which is denoted as ‘0’ for 4 weeks of chilling or ‘1’ for 6 weeks of chilling and ‘chill2’ which is ‘1’ for 8 weeks of chilling:

$$y_i = \alpha_{species[i]} + \beta_{tx_{species[i]}} X_{tx} + \beta_{chill1_{species[i]}} X_{chill1} + \beta_{chill2_{species[i]}} X_{chill2} + \beta_{txchill1_{species[i]}} X_{txchill1} + \beta_{txchill2_{species[i]}} X_{txchill2} + \epsilon_i \quad (1)$$

$$\epsilon_i \sim N(0, \sigma_y)$$

The α and each of the five β coefficients are modeled at the species level, as follows:

$$\begin{aligned} \alpha_{species} &\sim N(\mu_\alpha, \sigma_\alpha) \\ \beta_{tx_{species}} &\sim N(\mu_{tx}, \sigma_{tx}) \\ \beta_{chill1_{species}} &\sim N(\mu_{chill1}, \sigma_{chill1}) \\ \beta_{chill2_{species}} &\sim N(\mu_{chill2}, \sigma_{chill2}) \\ \beta_{txchill1_{species}} &\sim N(\mu_{txchill1}, \sigma_{txchill1}) \\ \beta_{txchill2_{species}} &\sim N(\mu_{txchill2}, \sigma_{txchill2}) \end{aligned}$$

where i represents each unique observation, $species$ is the species, α represents the intercept, β terms represent slope estimates, and y is the phenology or growth measurement. For the shoot apical meristem model, we used a Bernoulli distribution, which is modeled as:

$$\begin{aligned}
y_i &\sim \text{Binomial}(1, p) \\
\text{logit}(p) &= \alpha_{\text{species}[i]} + \beta_{tx_{\text{species}[i]}} X_{tx} + \beta_{chill1_{\text{species}[i]}} X_{chill1} + \beta_{chill2_{\text{species}[i]}} X_{chill2} \\
&\quad + \beta_{txchill1_{\text{species}[i]}} X_{txchill1} + \beta_{txchill2_{\text{species}[i]}} X_{txchill2} + \epsilon_i
\end{aligned} \tag{2}$$

22 The α and each of the five β coefficients are modeled the same as the other models:

$$\begin{aligned}
\alpha_{\text{species}} &\sim N(\mu_\alpha, \sigma_\alpha) \\
\beta_{tx_{\text{species}}} &\sim N(\mu_{tx}, \sigma_{tx}) \\
\beta_{chill1_{\text{species}}} &\sim N(\mu_{chill1}, \sigma_{chill1}) \\
\beta_{chill2_{\text{species}}} &\sim N(\mu_{chill2}, \sigma_{chill2}) \\
\beta_{txchill1_{\text{species}}} &\sim N(\mu_{txchill1}, \sigma_{txchill1}) \\
\beta_{txchill2_{\text{species}}} &\sim N(\mu_{txchill2}, \sigma_{txchill2})
\end{aligned}$$

23 Supplemental tables and figures

Table S1: Summary of simple linear regression model of day of budburst across chilling treatments.

term	mean	std.err
Intercept	28.58	1.22
Chilling 6 Wks	-2.79	1.74
Chilling 8 Wks	-7.63	1.76

Table S2: Summary of simple linear regression model of duration of vegetative across chilling treatments.

term	mean	std.err
Intercept	18.35	0.54
Chilling 6 Wks	-2.07	0.77
Chilling 8 Wks	-2.72	0.78

Table S3: Summary of model with the effects of false spring treatment and chilling duration across species on duration of vegetative risk.

	mean	2%	10%	25%	75%	90%	98%
Intercept	16.02	12.46	13.60	15.08	16.90	18.52	20.23
Tx	2.97	1.13	1.68	2.45	3.49	4.26	4.87
Chill 6 Wks	-0.53	-3.83	-2.73	-1.38	0.32	1.72	2.99
Chill 8 Wks	-2.67	-5.54	-4.56	-3.35	-1.94	-0.85	0.03
Tx:Chill 6 Wks	-0.91	-3.59	-2.78	-1.65	-0.17	0.92	1.85
Tx:Chill 8 Wks	0.62	-1.97	-1.14	-0.08	1.34	2.38	3.25
<i>Acer saccharinum</i> ,Intercept	-3.06	-7.74	-5.82	-4.12	-1.93	-0.40	0.75
<i>Alnus incana rugosa</i> ,Intercept	4.39	0.17	1.66	3.33	5.44	7.19	8.51
<i>Betula papyrifera</i> ,Intercept	0.96	-3.52	-1.86	-0.06	2.02	3.69	4.85
<i>Betula populifolia</i> ,Intercept	0.20	-4.12	-2.47	-0.86	1.27	2.93	4.19
<i>Cornus racemosa</i> ,Intercept	0.48	-3.87	-2.35	-0.54	1.57	3.10	4.26
<i>Salix purpurea</i> ,Intercept	-5.49	-10.38	-8.46	-6.57	-4.33	-2.69	-1.40
<i>Sorbus americana</i> ,Intercept	-1.14	-5.56	-3.88	-2.20	-0.07	1.60	2.79
<i>Viburnum dendatum</i> ,Intercept	3.57	-0.78	0.80	2.51	4.67	6.29	7.69
<i>Acer saccharinum</i> ,Tx	-0.36	-2.80	-1.82	-0.72	0.05	0.63	1.27
<i>Alnus incana rugosa</i> ,Tx	0.37	-1.36	-0.73	-0.06	0.76	1.91	2.86
<i>Betula papyrifera</i> ,Tx	0.45	-1.17	-0.54	-0.03	0.84	2.03	3.08
<i>Betula populifolia</i> ,Tx	-0.43	-3.09	-1.97	-0.80	0.04	0.55	1.12
<i>Cornus racemosa</i> ,Tx	0.00	-1.93	-1.15	-0.29	0.32	1.13	1.91
<i>Salix purpurea</i> ,Tx	-0.14	-2.48	-1.59	-0.55	0.25	1.21	2.14
<i>Sorbus americana</i> ,Tx	-0.21	-2.43	-1.57	-0.54	0.15	0.84	1.57
<i>Viburnum dendatum</i> ,Tx	0.35	-1.38	-0.75	-0.10	0.74	1.93	2.86
<i>Acer saccharinum</i> ,Chill 6 Wks	-0.13	-4.23	-2.82	-1.21	0.92	2.61	4.04
<i>Alnus incana rugosa</i> ,Chill 6 Wks	-0.66	-4.71	-3.50	-1.71	0.41	2.10	3.53
<i>Betula papyrifera</i> ,Chill 6 Wks	1.50	-2.35	-1.14	0.40	2.54	4.30	5.65
<i>Betula populifolia</i> ,Chill 6 Wks	-0.59	-4.77	-3.43	-1.62	0.50	2.10	3.22
<i>Cornus racemosa</i> ,Chill 6 Wks	0.46	-3.46	-2.14	-0.56	1.48	3.11	4.43
<i>Salix purpurea</i> ,Chill 6 Wks	4.60	0.55	1.62	3.26	5.84	7.88	9.27
<i>Sorbus americana</i> ,Chill 6 Wks	-2.20	-6.59	-5.11	-3.27	-1.02	0.45	1.44
<i>Viburnum dendatum</i> ,Chill 6 Wks	-3.19	-7.67	-6.24	-4.28	-2.01	-0.48	0.62
<i>Acer saccharinum</i> ,Chill 8 Wks	0.94	-2.40	-1.30	-0.02	1.85	3.42	4.57
<i>Alnus incana rugosa</i> ,Chill 8 Wks	-1.32	-5.07	-3.77	-2.23	-0.38	1.04	2.09
<i>Betula papyrifera</i> ,Chill 8 Wks	0.21	-3.49	-2.22	-0.68	1.12	2.52	3.77
<i>Betula populifolia</i> ,Chill 8 Wks	-1.36	-5.28	-3.90	-2.25	-0.39	0.82	1.82
<i>Cornus racemosa</i> ,Chill 8 Wks	0.61	-2.76	-1.58	-0.30	1.48	2.94	4.23
<i>Salix purpurea</i> ,Chill 8 Wks	3.91	0.30	1.23	2.72	5.00	6.79	8.30
<i>Sorbus americana</i> ,Chill 8 Wks	-0.51	-4.16	-2.86	-1.41	0.41	1.76	2.89
<i>Viburnum dendatum</i> ,Chill 8 Wks	-2.54	-6.43	-5.09	-3.50	-1.50	-0.18	0.69
<i>Acer saccharinum</i> ,Tx:Chill 6 Wks	-0.46	-4.34	-2.80	-0.98	0.16	1.15	2.08
<i>Alnus incana rugosa</i> ,Tx:Chill 6 Wks	0.35	-2.54	-1.42	-0.27	0.89	2.66	4.38
<i>Betula papyrifera</i> ,Tx:Chill 6 Wks	0.33	-2.71	-1.36	-0.22	0.85	2.44	3.77
<i>Betula populifolia</i> ,Tx:Chill 6 Wks	-0.54	-4.45	-2.83	-1.05	0.11	1.06	2.03
<i>Cornus racemosa</i> ,Tx:Chill 6 Wks	0.23	-2.65	-1.45	-0.26	0.69	2.25	3.58
<i>Salix purpurea</i> ,Tx:Chill 6 Wks	1.07	-1.87	-0.80	0.02	1.84	4.03	5.96
<i>Sorbus americana</i> ,Tx:Chill 6 Wks	-0.44	-3.99	-2.60	-0.97	0.16	1.13	2.24
<i>Viburnum dendatum</i> ,Tx:Chill 6 Wks	-0.58	-4.61	-2.97	-1.16	0.10	1.07	2.17
<i>Acer saccharinum</i> ,Tx:Chill 8 Wks	-0.05	-2.85	-1.67	-0.45	0.33	1.47	2.79
<i>Alnus incana rugosa</i> ,Tx:Chill 8 Wks	0.12	-2.75	-1.46	-0.30	0.54	1.87	3.40

Table S3: Summary of model with the effects of false spring treatment and chilling duration across species on duration of vegetative risk.

	mean	2%	10%	25%	75%	90%	98%
<i>Betula papyrifera</i> ,Tx:Chill 8 Wks	0.31	-1.95	-1.01	-0.16	0.72	2.14	3.56
<i>Betula populifolia</i> ,Tx:Chill 8 Wks	-0.06	-2.98	-1.62	-0.43	0.33	1.43	2.66
<i>Cornus racemosa</i> ,Tx:Chill 8 Wks	0.40	-1.62	-0.83	-0.10	0.75	2.28	3.86
<i>Salix purpurea</i> ,Tx:Chill 8 Wks	-0.09	-3.49	-2.09	-0.58	0.43	1.75	2.95
<i>Sorbus americana</i> ,Tx:Chill 8 Wks	-0.48	-4.01	-2.61	-0.90	0.08	0.80	1.61
<i>Viburnum dentatum</i> ,Tx:Chill 8 Wks	-0.25	-3.57	-2.24	-0.67	0.26	1.25	2.36

Table S4: Summary of model with the effects of false spring treatment and chilling duration across species on growing season length.

	mean	2%	10%	25%	75%	90%	98%
Intercept	283.95	249.62	263.13	276.95	291.73	302.64	310.98
Tx	-0.32	-14.91	-9.61	-3.88	3.30	8.70	13.24
Chill 6 Wks	2.48	-8.70	-5.40	-0.78	5.64	10.60	14.02
Chill 8 Wks	-9.66	-21.36	-17.91	-12.97	-6.36	-1.56	2.78
Tx:Chill 6 Wks	-14.87	-30.38	-25.87	-19.39	-10.39	-4.08	0.58
Tx:Chill 8 Wks	-8.57	-26.11	-20.52	-13.22	-3.93	2.97	8.55
<i>Acer saccharinum</i> ,Intercept	-10.08	-38.20	-29.41	-18.27	-2.60	11.77	24.62
<i>Alnus incana rugosa</i> ,Intercept	34.87	6.79	15.33	26.40	42.61	56.76	71.28
<i>Betula papyrifera</i> ,Intercept	8.84	-18.52	-10.75	0.69	16.27	30.38	43.52
<i>Betula populifolia</i> ,Intercept	33.10	6.24	13.92	24.78	40.58	54.73	67.96
<i>Cornus racemosa</i> ,Intercept	-22.76	-50.18	-42.58	-30.94	-15.15	-1.52	10.97
<i>Salix purpurea</i> ,Intercept	38.58	10.89	19.10	30.08	45.87	60.65	73.96
<i>Sorbus americana</i> ,Intercept	-38.34	-66.08	-58.11	-46.41	-30.66	-17.21	-5.41
<i>Viburnum dentatum</i> ,Intercept	10.47	-17.45	-8.43	2.20	17.88	32.32	45.39
<i>Acer saccharinum</i> ,Tx	0.48	-13.31	-8.48	-2.65	3.50	9.98	15.99
<i>Alnus incana rugosa</i> ,Tx	3.43	-10.16	-5.56	-0.26	6.82	14.28	20.26
<i>Betula papyrifera</i> ,Tx	2.81	-10.46	-5.48	-0.60	5.92	13.47	19.93
<i>Betula populifolia</i> ,Tx	3.94	-9.87	-4.75	-0.05	7.44	15.08	20.93
<i>Cornus racemosa</i> ,Tx	-4.95	-22.59	-16.02	-8.55	-0.62	3.61	8.59
<i>Salix purpurea</i> ,Tx	5.07	-8.45	-3.61	0.57	8.73	16.44	22.97
<i>Sorbus americana</i> ,Tx	-9.46	-30.44	-22.95	-14.30	-3.43	0.68	3.58
<i>Viburnum dentatum</i> ,Tx	4.80	-7.73	-3.57	0.42	8.43	16.24	22.77
<i>Acer saccharinum</i> ,Chill 6 Wks	1.16	-8.90	-5.20	-0.93	2.94	9.46	14.87
<i>Alnus incana rugosa</i> ,Chill 6 Wks	-3.09	-20.08	-13.31	-5.34	0.10	2.94	6.95
<i>Betula papyrifera</i> ,Chill 6 Wks	0.24	-10.97	-6.27	-1.58	1.99	7.16	12.24
<i>Betula populifolia</i> ,Chill 6 Wks	-0.95	-15.17	-8.97	-2.88	1.09	5.84	10.95
<i>Cornus racemosa</i> ,Chill 6 Wks	2.10	-7.28	-3.91	-0.36	4.11	11.14	17.59
<i>Salix purpurea</i> ,Chill 6 Wks	-2.49	-18.32	-12.13	-4.73	0.26	3.66	8.14
<i>Sorbus americana</i> ,Chill 6 Wks	2.48	-8.47	-4.22	-0.38	4.85	12.27	18.17
<i>Viburnum dentatum</i> ,Chill 6 Wks	-0.86	-14.00	-8.25	-2.71	1.06	5.52	10.41
<i>Acer saccharinum</i> ,Chill 8 Wks	2.26	-7.25	-3.68	-0.34	4.17	12.18	18.81
<i>Alnus incana rugosa</i> ,Chill 8 Wks	-1.09	-16.13	-9.56	-3.06	1.06	5.89	11.52
<i>Betula papyrifera</i> ,Chill 8 Wks	-0.91	-14.89	-8.74	-2.59	1.12	5.12	10.29
<i>Betula populifolia</i> ,Chill 8 Wks	-0.95	-15.15	-9.10	-2.78	1.07	5.71	10.63
<i>Cornus racemosa</i> ,Chill 8 Wks	-0.85	-15.44	-9.03	-2.70	1.25	5.75	10.64
<i>Salix purpurea</i> ,Chill 8 Wks	-2.05	-18.54	-11.57	-4.14	0.54	4.45	9.19
<i>Sorbus americana</i> ,Chill 8 Wks	1.65	-10.95	-5.72	-0.87	3.86	11.56	18.34
<i>Viburnum dentatum</i> ,Chill 8 Wks	1.14	-10.13	-5.30	-0.98	2.88	9.66	15.57
<i>Acer saccharinum</i> ,Tx:Chill 6 Wks	-1.83	-20.16	-11.95	-3.63	0.73	5.03	9.99
<i>Alnus incana rugosa</i> ,Tx:Chill 6 Wks	0.00	-15.03	-8.42	-2.10	2.09	8.55	15.36
<i>Betula papyrifera</i> ,Tx:Chill 6 Wks	-0.27	-14.41	-8.15	-2.15	1.62	7.46	13.60
<i>Betula populifolia</i> ,Tx:Chill 6 Wks	0.93	-12.03	-6.77	-1.41	2.96	10.16	17.80
<i>Cornus racemosa</i> ,Tx:Chill 6 Wks	0.11	-14.72	-8.28	-2.04	2.17	8.70	15.64
<i>Salix purpurea</i> ,Tx:Chill 6 Wks	-0.04	-15.83	-8.51	-2.13	2.11	8.46	15.94
<i>Sorbus americana</i> ,Tx:Chill 6 Wks	0.64	-15.11	-7.97	-2.03	3.01	10.74	17.88
<i>Viburnum dentatum</i> ,Tx:Chill 6 Wks	0.83	-12.37	-6.44	-1.32	2.63	10.09	17.67
<i>Acer saccharinum</i> ,Tx:Chill 8 Wks	2.41	-12.37	-6.29	-0.88	5.15	14.84	22.85
<i>Alnus incana rugosa</i> ,Tx:Chill 8 Wks	1.07	-16.64	-9.14	-1.88	3.93	12.31	20.49

Table S4: Summary of model with the effects of false spring treatment and chilling duration across species on growing season length.

	mean	2%	10%	25%	75%	90%	98%
<i>Betula papyrifera</i> ,Tx:Chill 8 Wks	2.65	-11.25	-5.91	-0.76	5.52	15.06	22.65
<i>Betula populifolia</i> ,Tx:Chill 8 Wks	0.32	-16.97	-10.49	-2.47	3.00	11.13	18.57
<i>Cornus racemosa</i> ,Tx:Chill 8 Wks	-0.64	-18.64	-11.44	-3.57	2.09	9.71	17.07
<i>Salix purpurea</i> ,Tx:Chill 8 Wks	0.80	-17.89	-9.83	-2.16	3.62	12.46	21.20
<i>Sorbus americana</i> ,Tx:Chill 8 Wks	-6.00	-33.31	-23.19	-10.33	-0.07	3.65	8.57
<i>Viburnum dentatum</i> ,Tx:Chill 8 Wks	2.04	-14.08	-7.10	-1.10	4.83	14.10	22.46

Table S5: Summary of model with the effects of false spring treatment and chilling duration across species on shoot apical meristem damage.

	mean	2%	10%	25%	75%	90%	98%
Intercept	-1.68	-4.65	-3.49	-2.25	-1.03	-0.13	0.68
Tx	2.07	-0.42	0.61	1.51	2.60	3.58	4.61
Chill 6 Wks	-0.53	-5.64	-3.63	-1.53	0.51	2.33	4.17
Chill 8 Wks	-0.18	-3.35	-2.07	-0.82	0.51	1.61	2.75
Tx:Chill 6 Wks	-0.21	-4.25	-2.41	-0.98	0.60	1.92	3.34
Tx:Chill 8 Wks	0.28	-2.60	-1.60	-0.51	0.99	2.40	3.99
<i>Acer saccharinum</i> ,Intercept	-0.45	-3.53	-2.38	-1.18	0.27	1.44	2.54
<i>Alnus incana rugosa</i> ,Intercept	0.44	-2.16	-1.28	-0.27	1.09	2.36	3.64
<i>Betula papyrifera</i> ,Intercept	0.32	-2.31	-1.43	-0.37	0.96	2.23	3.43
<i>Betula populifolia</i> ,Intercept	-2.15	-6.79	-4.94	-3.02	-1.08	0.04	1.05
<i>Cornus racemosa</i> ,Intercept	0.94	-1.78	-0.86	0.15	1.62	2.98	4.28
<i>Salix purpurea</i> ,Intercept	1.56	-0.95	-0.14	0.79	2.25	3.57	4.83
<i>Sorbus americana</i> ,Intercept	-2.48	-8.23	-5.93	-3.42	-1.19	-0.05	0.81
<i>Viburnum dendatum</i> ,Intercept	1.84	-0.89	-0.00	1.03	2.58	3.90	5.11
<i>Acer saccharinum</i> ,Tx	-0.08	-2.98	-1.75	-0.54	0.40	1.52	2.86
<i>Alnus incana rugosa</i> ,Tx	0.42	-2.10	-0.97	-0.09	0.87	2.27	3.77
<i>Betula papyrifera</i> ,Tx	-0.21	-3.24	-1.89	-0.62	0.24	1.21	2.54
<i>Betula populifolia</i> ,Tx	-1.23	-7.03	-4.50	-1.95	-0.05	0.53	1.26
<i>Cornus racemosa</i> ,Tx	0.83	-1.70	-0.73	-0.01	1.35	3.52	6.42
<i>Salix purpurea</i> ,Tx	-0.41	-3.57	-2.15	-0.86	0.09	0.93	2.06
<i>Sorbus americana</i> ,Tx	-0.62	-5.42	-3.30	-1.24	0.12	1.30	2.71
<i>Viburnum dendatum</i> ,Tx	1.43	-1.26	-0.56	0.07	2.12	5.51	9.44
<i>Acer saccharinum</i> ,Chill 6 Wks	-3.92	-16.21	-10.63	-5.39	-1.57	0.23	1.52
<i>Alnus incana rugosa</i> ,Chill 6 Wks	-0.17	-5.50	-3.35	-1.29	0.95	3.00	5.13
<i>Betula papyrifera</i> ,Chill 6 Wks	-1.96	-8.74	-5.81	-3.14	-0.57	1.27	3.23
<i>Betula populifolia</i> ,Chill 6 Wks	2.17	-3.16	-1.27	0.68	3.48	6.17	8.67
<i>Cornus racemosa</i> ,Chill 6 Wks	0.86	-4.19	-2.22	-0.36	1.99	4.30	6.56
<i>Salix purpurea</i> ,Chill 6 Wks	-0.46	-5.74	-3.59	-1.55	0.63	2.69	4.98
<i>Sorbus americana</i> ,Chill 6 Wks	-2.90	-17.31	-10.27	-4.52	-0.34	1.95	3.78
<i>Viburnum dendatum</i> ,Chill 6 Wks	5.87	-0.04	0.97	2.95	7.48	14.25	21.82
<i>Acer saccharinum</i> ,Chill 8 Wks	-1.58	-7.47	-4.63	-2.37	-0.42	0.53	1.60
<i>Alnus incana rugosa</i> ,Chill 8 Wks	-1.42	-6.46	-4.32	-2.22	-0.33	0.56	1.59
<i>Betula papyrifera</i> ,Chill 8 Wks	-0.43	-4.14	-2.58	-1.12	0.28	1.57	2.83
<i>Betula populifolia</i> ,Chill 8 Wks	0.56	-3.60	-2.12	-0.43	1.46	3.66	5.55
<i>Cornus racemosa</i> ,Chill 8 Wks	-0.09	-3.92	-2.40	-0.79	0.67	2.07	3.20
<i>Salix purpurea</i> ,Chill 8 Wks	0.06	-3.17	-1.99	-0.63	0.74	2.18	3.48
<i>Sorbus americana</i> ,Chill 8 Wks	-0.37	-6.14	-3.60	-1.34	0.68	2.62	4.40
<i>Viburnum dendatum</i> ,Chill 8 Wks	3.26	-0.28	0.20	1.59	4.35	7.91	11.92
<i>Acer saccharinum</i> ,Tx:Chill 6 Wks	-0.65	-8.36	-4.47	-1.24	0.23	1.96	4.00
<i>Alnus incana rugosa</i> ,Tx:Chill 6 Wks	0.12	-3.75	-2.05	-0.45	0.66	2.39	4.50
<i>Betula papyrifera</i> ,Tx:Chill 6 Wks	0.18	-4.05	-2.06	-0.47	0.69	2.91	5.48
<i>Betula populifolia</i> ,Tx:Chill 6 Wks	1.30	-2.09	-0.92	0.00	2.10	5.41	8.54
<i>Cornus racemosa</i> ,Tx:Chill 6 Wks	-1.06	-7.96	-4.78	-1.80	0.03	0.94	2.28
<i>Salix purpurea</i> ,Tx:Chill 6 Wks	0.22	-3.42	-1.74	-0.38	0.73	2.70	4.64
<i>Sorbus americana</i> ,Tx:Chill 6 Wks	-0.37	-9.27	-4.39	-0.99	0.57	2.71	5.35
<i>Viburnum dendatum</i> ,Tx:Chill 6 Wks	0.11	-7.38	-3.87	-0.87	0.87	4.60	9.62
<i>Acer saccharinum</i> ,Tx:Chill 8 Wks	0.35	-3.25	-1.77	-0.32	0.82	3.00	5.96
<i>Alnus incana rugosa</i> ,Tx:Chill 8 Wks	-0.09	-4.24	-2.25	-0.63	0.41	1.96	4.23

Table S5: Summary of model with the effects of false spring treatment and chilling duration across species on shoot apical meristem damage.

	mean	2%	10%	25%	75%	90%	98%
<i>Betula papyrifera</i> ,Tx:Chill 8 Wks	0.07	-3.48	-1.82	-0.40	0.55	1.97	3.60
<i>Betula populifolia</i> ,Tx:Chill 8 Wks	-1.34	-10.73	-5.87	-1.96	0.02	0.92	2.05
<i>Cornus racemosa</i> ,Tx:Chill 8 Wks	0.81	-2.28	-1.16	-0.10	1.32	4.28	7.73
<i>Salix purpurea</i> ,Tx:Chill 8 Wks	-0.38	-4.53	-2.76	-0.87	0.21	1.33	2.53
<i>Sorbus americana</i> ,Tx:Chill 8 Wks	0.73	-3.06	-1.55	-0.19	1.28	4.38	7.63
<i>Viburnum dentatum</i> ,Tx:Chill 8 Wks	-0.06	-6.79	-3.54	-0.95	0.61	3.57	8.46

Table S6: Summary of model with the effects of false spring treatment and chilling duration across species on total season growth.

	mean	2%	10%	25%	75%	90%	98%
Intercept	54.03	19.77	30.82	44.95	63.22	77.68	88.97
Tx	5.06	-5.39	-1.90	2.24	7.79	12.11	15.41
Chill 6 Wks	2.92	-7.38	-3.78	0.23	5.58	9.54	12.68
Chill 8 Wks	11.00	1.51	4.47	8.38	13.59	17.62	20.87
Tx:Chill 6 Wks	-8.40	-23.96	-18.63	-12.47	-4.27	2.04	6.88
Tx:Chill 8 Wks	-11.33	-23.91	-20.44	-15.01	-7.63	-2.35	1.62
<i>Acer saccharinum</i> ,Intercept	1.28	-33.73	-23.06	-8.28	10.85	25.03	36.28
<i>Alnus incana rugosa</i> ,Intercept	16.28	-19.47	-7.82	6.99	25.58	39.89	51.14
<i>Betula papyrifera</i> ,Intercept	-17.33	-52.49	-41.43	-26.58	-7.98	6.77	17.33
<i>Betula populifolia</i> ,Intercept	14.94	-20.58	-8.73	5.58	24.26	38.69	49.95
<i>Cornus racemosa</i> ,Intercept	-36.89	-73.12	-60.99	-46.21	-27.51	-12.98	-2.26
<i>Salix purpurea</i> ,Intercept	77.74	42.27	53.50	68.33	87.21	101.66	113.37
<i>Sorbus americana</i> ,Intercept	-57.75	-93.73	-82.01	-67.20	-48.15	-34.18	-22.42
<i>Viburnum dendatum</i> ,Intercept	-1.58	-36.76	-25.23	-10.72	7.79	22.17	32.68
<i>Acer saccharinum</i> ,Tx	-3.07	-18.11	-12.61	-5.61	0.08	3.49	7.64
<i>Alnus incana rugosa</i> ,Tx	5.01	-4.64	-1.72	0.51	8.30	16.58	22.75
<i>Betula papyrifera</i> ,Tx	0.37	-12.64	-7.68	-2.00	2.81	8.52	13.53
<i>Betula populifolia</i> ,Tx	-0.05	-12.57	-7.50	-2.27	2.18	7.54	11.97
<i>Cornus racemosa</i> ,Tx	-0.01	-13.89	-8.63	-2.48	2.58	8.10	12.88
<i>Salix purpurea</i> ,Tx	-5.43	-22.80	-16.75	-9.16	-0.78	2.04	5.04
<i>Sorbus americana</i> ,Tx	1.17	-11.81	-6.70	-1.44	3.82	9.75	14.82
<i>Viburnum dendatum</i> ,Tx	1.78	-9.55	-4.99	-0.77	4.12	10.63	16.16
<i>Acer saccharinum</i> ,Chill 6 Wks	1.05	-8.99	-4.60	-0.87	2.70	8.36	14.05
<i>Alnus incana rugosa</i> ,Chill 6 Wks	-3.36	-20.06	-13.74	-5.85	0.03	2.55	5.58
<i>Betula papyrifera</i> ,Chill 6 Wks	-1.13	-14.13	-8.89	-2.99	0.84	5.21	9.26
<i>Betula populifolia</i> ,Chill 6 Wks	0.92	-8.65	-4.71	-0.96	2.50	8.03	13.57
<i>Cornus racemosa</i> ,Chill 6 Wks	2.71	-6.74	-3.46	-0.20	4.94	12.46	19.97
<i>Salix purpurea</i> ,Chill 6 Wks	0.29	-11.79	-7.01	-1.79	2.25	8.24	13.14
<i>Sorbus americana</i> ,Chill 6 Wks	0.46	-10.54	-6.26	-1.47	2.24	7.99	13.69
<i>Viburnum dendatum</i> ,Chill 6 Wks	-0.61	-12.34	-7.66	-2.18	1.20	5.38	9.63
<i>Acer saccharinum</i> ,Chill 8 Wks	0.22	-8.74	-4.92	-1.18	1.52	5.74	10.82
<i>Alnus incana rugosa</i> ,Chill 8 Wks	-1.20	-14.35	-8.61	-2.64	0.66	4.05	7.73
<i>Betula papyrifera</i> ,Chill 8 Wks	1.19	-7.86	-3.75	-0.60	2.60	8.08	12.93
<i>Betula populifolia</i> ,Chill 8 Wks	0.67	-7.84	-4.27	-0.85	1.87	6.93	12.13
<i>Cornus racemosa</i> ,Chill 8 Wks	0.13	-10.11	-5.92	-1.33	1.66	6.24	10.78
<i>Salix purpurea</i> ,Chill 8 Wks	-1.87	-15.77	-10.41	-3.59	0.42	3.68	7.34
<i>Sorbus americana</i> ,Chill 8 Wks	-0.52	-13.41	-7.28	-1.96	1.23	5.16	8.91
<i>Viburnum dendatum</i> ,Chill 8 Wks	0.97	-7.33	-3.92	-0.66	2.22	7.67	12.63
<i>Acer saccharinum</i> ,Tx:Chill 6 Wks	-1.97	-22.39	-14.47	-5.51	1.56	8.69	15.28
<i>Alnus incana rugosa</i> ,Tx:Chill 6 Wks	-6.55	-31.17	-22.08	-11.38	-0.50	4.22	9.53
<i>Betula papyrifera</i> ,Tx:Chill 6 Wks	-7.28	-31.70	-23.07	-12.32	-0.91	3.17	7.48
<i>Betula populifolia</i> ,Tx:Chill 6 Wks	2.09	-14.47	-7.83	-1.56	5.51	14.28	21.42
<i>Cornus racemosa</i> ,Tx:Chill 6 Wks	8.74	-6.89	-2.22	1.52	14.16	25.76	35.10
<i>Salix purpurea</i> ,Tx:Chill 6 Wks	0.72	-18.38	-11.73	-3.54	4.82	13.89	21.05
<i>Sorbus americana</i> ,Tx:Chill 6 Wks	1.80	-15.69	-9.78	-2.04	5.79	14.35	22.80
<i>Viburnum dendatum</i> ,Tx:Chill 6 Wks	2.85	-12.75	-7.76	-1.04	6.51	15.59	23.44
<i>Acer saccharinum</i> ,Tx:Chill 8 Wks	0.18	-12.07	-6.72	-1.67	1.92	7.53	13.60
<i>Alnus incana rugosa</i> ,Tx:Chill 8 Wks	-0.06	-14.29	-8.33	-2.00	1.90	8.07	14.34

Table S6: Summary of model with the effects of false spring treatment and chilling duration across species on total season growth.

	mean	2%	10%	25%	75%	90%	98%
<i>Betula papyrifera</i> ,Tx:Chill 8 Wks	1.58	-9.94	-4.97	-0.70	3.55	10.38	17.16
<i>Betula populifolia</i> ,Tx:Chill 8 Wks	-0.10	-12.32	-6.99	-1.86	1.58	6.75	11.71
<i>Cornus racemosa</i> ,Tx:Chill 8 Wks	1.52	-9.59	-5.34	-0.87	3.45	10.73	17.62
<i>Salix purpurea</i> ,Tx:Chill 8 Wks	-1.93	-19.13	-12.65	-4.38	0.87	5.90	11.29
<i>Sorbus americana</i> ,Tx:Chill 8 Wks	1.44	-10.84	-6.16	-0.98	3.64	10.95	17.83
<i>Viburnum dentatum</i> ,Tx:Chill 8 Wks	-2.43	-20.46	-12.36	-4.36	0.29	3.57	7.60

Table S7: Summary of model with the effects of false spring treatment and chilling duration across species on total biomass.

	mean	2%	10%	25%	75%	90%	98%
Intercept	49.26	27.73	34.80	43.68	55.16	63.02	69.20
Tx	-3.41	-9.89	-8.08	-5.27	-1.55	1.15	3.47
Chill 6 Wks	0.39	-6.74	-4.36	-1.55	2.29	5.20	7.81
Chill 8 Wks	2.58	-4.64	-2.31	0.55	4.56	7.58	9.92
Tx:Chill 6 Wks	-0.59	-9.92	-7.10	-3.37	2.06	6.10	9.03
Tx:Chill 8 Wks	3.77	-5.75	-2.83	1.13	6.42	10.47	13.14
Intercept	49.06	28.12	34.71	43.77	54.77	62.43	68.15
<i>Acer saccharinum</i> ,Intercept	3.91	-16.51	-10.19	-2.04	9.57	18.72	26.20
<i>Alnus incana rugosa</i> ,Intercept	43.69	23.67	29.56	37.62	49.34	58.87	66.02
<i>Betula papyrifera</i> ,Intercept	-13.61	-33.58	-27.43	-19.46	-7.89	1.31	8.48
<i>Betula populifolia</i> ,Intercept	6.46	-13.58	-7.58	0.46	12.18	21.50	28.50
<i>Cornus racemosa</i> ,Intercept	-3.40	-23.25	-17.50	-9.36	2.25	11.53	18.08
<i>Salix purpurea</i> ,Intercept	36.46	16.89	22.39	30.53	42.05	51.62	59.11
<i>Sorbus americana</i> ,Intercept	-30.68	-50.72	-44.79	-36.60	-24.97	-15.66	-8.88
<i>Viburnum dendatum</i> ,Intercept	-14.67	-34.35	-28.81	-20.56	-8.91	0.09	6.99
<i>Acer saccharinum</i> ,Tx	-0.29	-6.96	-3.85	-1.04	0.56	2.71	5.05
<i>Alnus incana rugosa</i> ,Tx	0.42	-5.60	-3.06	-0.63	1.31	4.62	7.89
<i>Betula papyrifera</i> ,Tx	0.08	-5.79	-3.25	-0.71	0.88	3.53	6.24
<i>Betula populifolia</i> ,Tx	0.53	-4.48	-2.32	-0.39	1.28	4.26	7.61
<i>Cornus racemosa</i> ,Tx	-0.56	-7.56	-4.32	-1.35	0.38	2.32	4.50
<i>Salix purpurea</i> ,Tx	-0.44	-7.54	-4.49	-1.31	0.56	2.88	5.10
<i>Sorbus americana</i> ,Tx	-0.14	-6.77	-3.80	-0.96	0.73	3.20	5.86
<i>Viburnum dendatum</i> ,Tx	0.43	-4.76	-2.59	-0.50	1.17	4.45	7.28
<i>Acer saccharinum</i> ,Chill 6 Wks	1.49	-4.32	-2.04	-0.18	2.63	7.53	12.00
<i>Alnus incana rugosa</i> ,Chill 6 Wks	-1.69	-12.66	-8.10	-3.19	0.21	2.61	5.31
<i>Betula papyrifera</i> ,Chill 6 Wks	-0.92	-10.34	-6.41	-2.09	0.51	3.07	5.56
<i>Betula populifolia</i> ,Chill 6 Wks	-0.28	-8.41	-4.88	-1.39	0.88	3.90	7.16
<i>Cornus racemosa</i> ,Chill 6 Wks	-0.49	-9.07	-5.41	-1.55	0.75	3.71	6.46
<i>Salix purpurea</i> ,Chill 6 Wks	-0.30	-8.90	-5.43	-1.53	0.94	4.43	8.05
<i>Sorbus americana</i> ,Chill 6 Wks	1.26	-5.46	-2.72	-0.29	2.50	7.02	11.38
<i>Viburnum dendatum</i> ,Chill 6 Wks	0.53	-6.88	-3.62	-0.69	1.65	5.56	8.91
<i>Acer saccharinum</i> ,Chill 8 Wks	0.20	-8.38	-4.85	-1.16	1.54	5.38	8.77
<i>Alnus incana rugosa</i> ,Chill 8 Wks	-0.77	-10.60	-6.71	-2.42	0.93	4.44	7.95
<i>Betula papyrifera</i> ,Chill 8 Wks	1.38	-5.93	-2.93	-0.30	2.96	7.05	10.73
<i>Betula populifolia</i> ,Chill 8 Wks	-1.31	-10.81	-7.20	-2.78	0.35	2.79	5.61
<i>Cornus racemosa</i> ,Chill 8 Wks	1.61	-5.17	-2.47	-0.15	2.95	7.54	11.45
<i>Salix purpurea</i> ,Chill 8 Wks	-2.99	-14.97	-10.63	-4.98	-0.19	1.50	3.55
<i>Sorbus americana</i> ,Chill 8 Wks	0.01	-8.73	-5.36	-1.41	1.56	4.97	7.88
<i>Viburnum dendatum</i> ,Chill 8 Wks	1.28	-5.84	-2.93	-0.33	2.72	6.88	10.76
<i>Acer saccharinum</i> ,Tx:Chill 6 Wks	-0.87	-12.34	-7.31	-2.28	0.77	4.21	7.46
<i>Alnus incana rugosa</i> ,Tx:Chill 6 Wks	-1.82	-14.80	-9.63	-3.66	0.42	3.50	6.71
<i>Betula papyrifera</i> ,Tx:Chill 6 Wks	-1.98	-14.88	-9.48	-3.64	0.23	2.68	5.21
<i>Betula populifolia</i> ,Tx:Chill 6 Wks	0.98	-7.16	-4.01	-0.64	2.40	7.27	11.84
<i>Cornus racemosa</i> ,Tx:Chill 6 Wks	0.56	-8.13	-4.51	-0.98	2.00	6.60	11.47
<i>Salix purpurea</i> ,Tx:Chill 6 Wks	0.63	-8.71	-4.93	-1.04	2.18	7.06	11.90
<i>Sorbus americana</i> ,Tx:Chill 6 Wks	0.64	-8.68	-4.76	-0.95	2.14	6.73	11.31
<i>Viburnum dendatum</i> ,Tx:Chill 6 Wks	1.51	-6.58	-3.41	-0.42	3.08	8.77	13.43
<i>Acer saccharinum</i> ,Tx:Chill 8 Wks	1.71	-4.94	-2.42	-0.21	3.14	8.66	13.63

Table S7: Summary of model with the effects of false spring treatment and chilling duration across species on total biomass.

	mean	2%	10%	25%	75%	90%	98%
<i>Alnus incana rugosa</i> ,Tx:Chill 8 Wks	0.49	-8.70	-5.08	-1.10	2.01	6.60	11.66
<i>Betula papyrifera</i> ,Tx:Chill 8 Wks	0.70	-7.60	-3.95	-0.74	1.99	6.43	10.94
<i>Betula populifolia</i> ,Tx:Chill 8 Wks	-0.68	-11.41	-6.55	-1.86	0.74	4.00	6.87
<i>Cornus racemosa</i> ,Tx:Chill 8 Wks	-0.68	-10.98	-6.69	-1.75	0.74	3.81	7.04
<i>Salix purpurea</i> ,Tx:Chill 8 Wks	-0.53	-11.31	-6.52	-1.95	0.99	4.76	8.65
<i>Sorbus americana</i> ,Tx:Chill 8 Wks	-0.61	-10.77	-6.46	-1.95	0.85	4.34	7.95

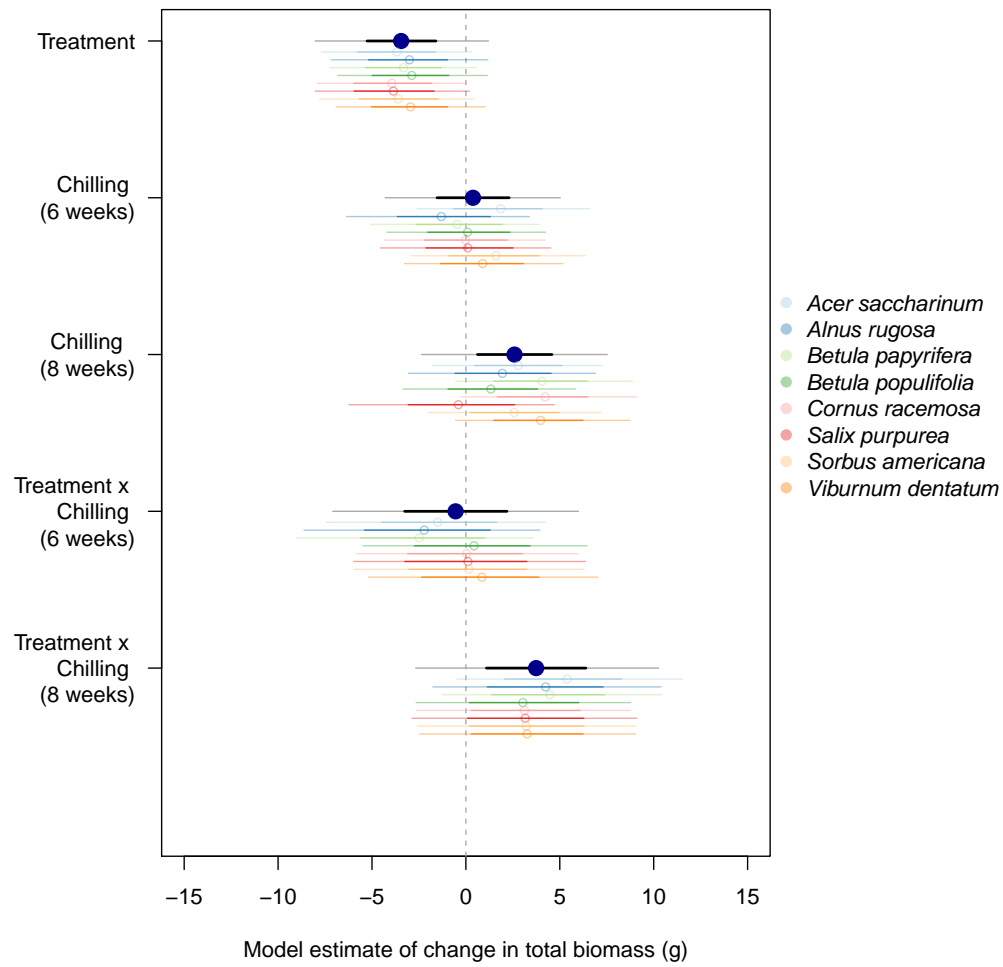


Figure S1: Effects of false spring treatment, six weeks of chilling and eight weeks of chilling on total aboveground and belowground biomass (g).

Table S8: Summary of model with the effects of false spring treatment and chilling duration across species on leaf chlorophyll content.

	mean	2%	10%	25%	75%	90%	98%
Intercept	30.96	24.38	26.36	29.21	32.74	35.50	37.89
Tx	-0.35	-2.16	-1.61	-0.88	0.15	0.92	1.48
Chill 6 Wks	-0.06	-2.07	-1.42	-0.62	0.49	1.30	1.92
Chill 8 Wks	0.43	-1.97	-1.03	-0.12	1.04	1.86	2.58
Tx:Chill 6 Wks	-1.04	-3.76	-2.90	-1.81	-0.26	0.84	1.68
Tx:Chill 8 Wks	-2.11	-4.74	-3.88	-2.81	-1.40	-0.36	0.31
<i>Acer saccharinum</i> ,Intercept	-5.84	-12.65	-10.48	-7.66	-4.06	-1.25	1.08
<i>Alnus incana rugosa</i> ,Intercept	5.66	-1.33	0.96	3.81	7.48	10.35	12.40
<i>Betula papyrifera</i> ,Intercept	-2.33	-9.20	-6.98	-4.13	-0.48	2.29	4.50
<i>Betula populifolia</i> ,Intercept	0.68	-6.50	-3.99	-1.12	2.48	5.33	7.54
<i>Cornus racemosa</i> ,Intercept	0.96	-5.84	-3.68	-0.88	2.81	5.61	7.89
<i>Salix purpurea</i> ,Intercept	12.24	5.25	7.55	10.37	14.05	16.89	19.14
<i>Sorbus americana</i> ,Intercept	-7.21	-14.06	-11.90	-9.05	-5.38	-2.60	-0.50
<i>Viburnum dendatum</i> ,Intercept	-4.83	-11.98	-9.46	-6.66	-2.98	-0.20	2.01
<i>Acer saccharinum</i> ,Tx	0.04	-1.77	-0.90	-0.22	0.30	1.03	1.81
<i>Alnus incana rugosa</i> ,Tx	-0.02	-1.91	-1.10	-0.30	0.26	1.13	1.91
<i>Betula papyrifera</i> ,Tx	-0.19	-2.44	-1.40	-0.44	0.13	0.69	1.34
<i>Betula populifolia</i> ,Tx	-0.10	-1.99	-1.22	-0.36	0.18	0.88	1.54
<i>Cornus racemosa</i> ,Tx	0.07	-1.68	-0.91	-0.21	0.34	1.18	2.03
<i>Salix purpurea</i> ,Tx	-0.45	-3.06	-2.09	-0.85	0.03	0.58	1.28
<i>Sorbus americana</i> ,Tx	0.31	-1.33	-0.65	-0.07	0.63	1.70	2.48
<i>Viburnum dendatum</i> ,Tx	0.30	-1.22	-0.58	-0.06	0.59	1.62	2.55
<i>Acer saccharinum</i> ,Chill 6 Wks	0.35	-1.81	-0.97	-0.11	0.80	1.98	3.05
<i>Alnus incana rugosa</i> ,Chill 6 Wks	-0.60	-3.81	-2.54	-1.09	0.02	0.68	1.35
<i>Betula papyrifera</i> ,Chill 6 Wks	0.61	-1.21	-0.56	-0.01	1.09	2.48	3.62
<i>Betula populifolia</i> ,Chill 6 Wks	0.31	-1.76	-0.97	-0.17	0.70	2.02	3.23
<i>Cornus racemosa</i> ,Chill 6 Wks	-0.38	-3.37	-2.16	-0.81	0.12	0.95	1.75
<i>Salix purpurea</i> ,Chill 6 Wks	-0.73	-3.84	-2.76	-1.33	-0.01	0.67	1.52
<i>Sorbus americana</i> ,Chill 6 Wks	0.11	-2.52	-1.41	-0.33	0.58	1.65	2.77
<i>Viburnum dendatum</i> ,Chill 6 Wks	0.33	-1.91	-0.98	-0.14	0.79	1.94	2.95
<i>Acer saccharinum</i> ,Chill 8 Wks	0.04	-2.46	-1.51	-0.43	0.47	1.61	2.85
<i>Alnus incana rugosa</i> ,Chill 8 Wks	0.33	-2.20	-1.18	-0.21	0.85	2.15	3.31
<i>Betula papyrifera</i> ,Chill 8 Wks	0.18	-2.29	-1.36	-0.31	0.65	1.86	3.04
<i>Betula populifolia</i> ,Chill 8 Wks	0.10	-2.41	-1.42	-0.38	0.56	1.74	2.94
<i>Cornus racemosa</i> ,Chill 8 Wks	1.12	-0.75	-0.27	0.15	1.82	3.46	4.88
<i>Salix purpurea</i> ,Chill 8 Wks	-0.31	-3.49	-2.24	-0.88	0.29	1.35	2.23
<i>Sorbus americana</i> ,Chill 8 Wks	-0.67	-3.89	-2.68	-1.24	0.01	0.73	1.60
<i>Viburnum dendatum</i> ,Chill 8 Wks	-0.71	-3.86	-2.78	-1.29	0.00	0.60	1.34
<i>Acer saccharinum</i> ,Tx:Chill 6 Wks	0.15	-2.87	-1.64	-0.38	0.70	2.05	3.36
<i>Alnus incana rugosa</i> ,Tx:Chill 6 Wks	0.20	-2.75	-1.60	-0.42	0.72	2.38	3.96
<i>Betula papyrifera</i> ,Tx:Chill 6 Wks	0.08	-3.05	-1.80	-0.44	0.61	1.97	3.09
<i>Betula populifolia</i> ,Tx:Chill 6 Wks	-0.78	-4.76	-3.31	-1.38	0.02	0.77	1.55
<i>Cornus racemosa</i> ,Tx:Chill 6 Wks	0.27	-2.46	-1.46	-0.29	0.78	2.32	3.82
<i>Salix purpurea</i> ,Tx:Chill 6 Wks	-1.15	-5.53	-3.86	-2.00	-0.07	0.73	1.76
<i>Sorbus americana</i> ,Tx:Chill 6 Wks	0.96	-1.46	-0.68	0.02	1.65	3.49	5.08
<i>Viburnum dendatum</i> ,Tx:Chill 6 Wks	0.37	-2.58	-1.32	-0.20	0.93	2.40	3.58
<i>Acer saccharinum</i> ,Tx:Chill 8 Wks	0.06	-2.13	-1.13	-0.25	0.35	1.38	2.47
<i>Alnus incana rugosa</i> ,Tx:Chill 8 Wks	0.06	-2.25	-1.22	-0.29	0.36	1.48	2.59

Table S8: Summary of model with the effects of false spring treatment and chilling duration across species on leaf chlorophyll content.

	mean	2%	10%	25%	75%	90%	98%
<i>Betula papyrifera</i> ,Tx:Chill 8 Wks	0.04	-2.22	-1.20	-0.26	0.32	1.31	2.41
<i>Betula populifolia</i> ,Tx:Chill 8 Wks	-0.06	-2.28	-1.37	-0.35	0.23	1.11	1.82
<i>Cornus racemosa</i> ,Tx:Chill 8 Wks	-0.01	-2.46	-1.27	-0.32	0.29	1.30	2.40
<i>Salix purpurea</i> ,Tx:Chill 8 Wks	-0.24	-3.31	-2.01	-0.62	0.20	1.13	2.13
<i>Sorbus americana</i> ,Tx:Chill 8 Wks	0.05	-2.33	-1.30	-0.27	0.39	1.44	2.54
<i>Viburnum dentatum</i> ,Tx:Chill 8 Wks	0.11	-2.08	-1.12	-0.22	0.42	1.51	2.74

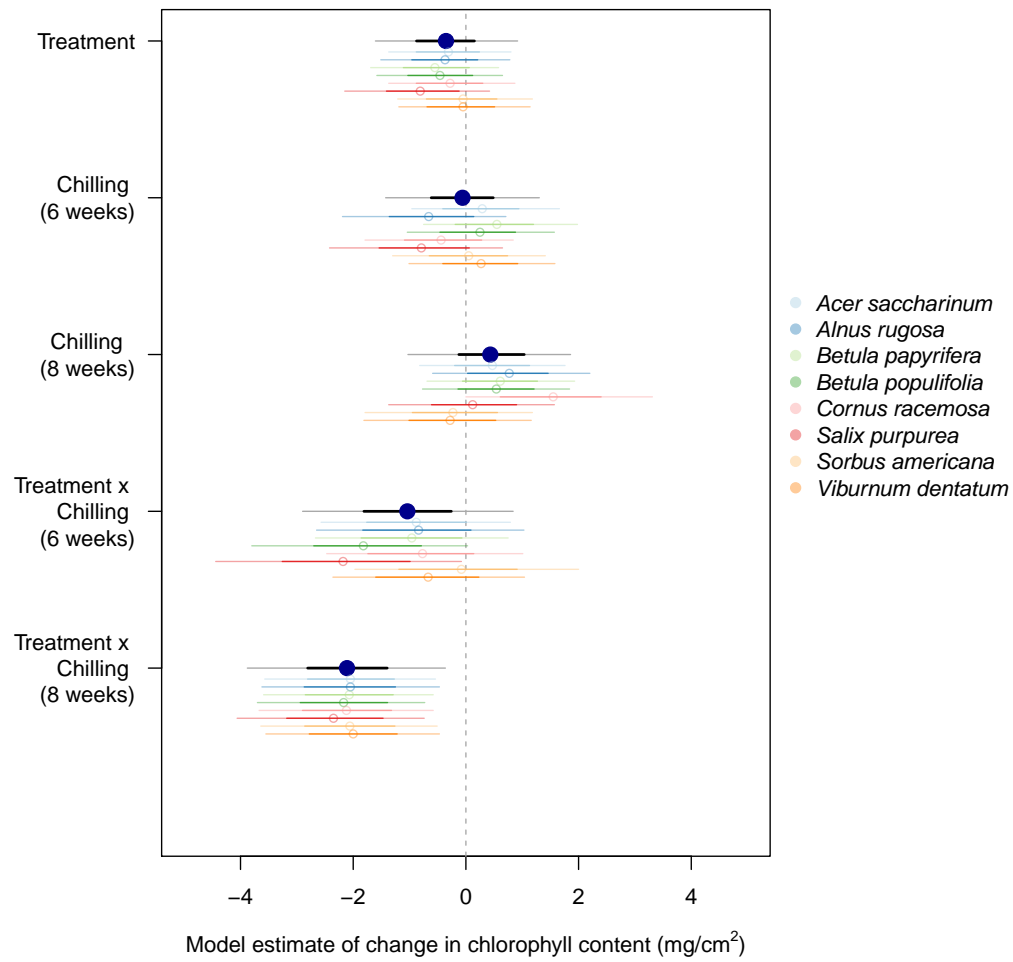


Figure S2: Effects of false spring treatment, six weeks of chilling and eight weeks of chilling on chlorophyll content.

Table S9: Summary of model with the effects of false spring treatment and chilling duration across species on leaf toughness.

	mean	2%	10%	25%	75%	90%	98%
Intercept	0.43	0.27	0.33	0.39	0.47	0.53	0.59
Tx	-0.05	-0.10	-0.08	-0.06	-0.04	-0.02	-0.00
Chill 6 Wks	-0.06	-0.11	-0.09	-0.07	-0.05	-0.03	-0.02
Chill 8 Wks	-0.05	-0.11	-0.09	-0.07	-0.04	-0.02	-0.00
Tx:Chill 6 Wks	0.02	-0.04	-0.02	0.01	0.04	0.06	0.08
Tx:Chill 8 Wks	0.02	-0.04	-0.02	0.01	0.04	0.06	0.08
Intercept	0.37	0.22	0.27	0.34	0.41	0.47	0.53
<i>Acer saccharinum</i> ,Intercept	-0.06	-0.22	-0.16	-0.10	-0.02	0.04	0.10
<i>Alnus incana rugosa</i> ,Intercept	-0.05	-0.21	-0.15	-0.09	-0.01	0.05	0.11
<i>Betula papyrifera</i> ,Intercept	-0.11	-0.28	-0.22	-0.15	-0.07	-0.01	0.05
<i>Betula populifolia</i> ,Intercept	-0.10	-0.27	-0.20	-0.14	-0.06	0.01	0.06
<i>Cornus racemosa</i> ,Intercept	-0.05	-0.21	-0.15	-0.09	-0.01	0.05	0.11
<i>Salix purpurea</i> ,Intercept	0.15	-0.01	0.05	0.11	0.19	0.26	0.32
<i>Sorbus americana</i> ,Intercept	-0.01	-0.17	-0.12	-0.05	0.03	0.10	0.16
<i>Viburnum dentatum</i> ,Intercept	0.25	0.08	0.14	0.21	0.29	0.35	0.41
<i>Acer saccharinum</i> ,Tx	-0.00	-0.06	-0.04	-0.01	0.01	0.03	0.05
<i>Alnus incana rugosa</i> ,Tx	0.01	-0.03	-0.02	-0.00	0.02	0.05	0.08
<i>Betula papyrifera</i> ,Tx	0.01	-0.05	-0.03	-0.00	0.02	0.04	0.06
<i>Betula populifolia</i> ,Tx	0.01	-0.05	-0.03	-0.01	0.02	0.04	0.06
<i>Cornus racemosa</i> ,Tx	0.02	-0.02	-0.01	0.00	0.04	0.07	0.09
<i>Salix purpurea</i> ,Tx	-0.01	-0.08	-0.06	-0.03	-0.00	0.02	0.03
<i>Sorbus americana</i> ,Tx	-0.01	-0.08	-0.05	-0.02	0.00	0.02	0.04
<i>Viburnum dentatum</i> ,Tx	-0.02	-0.09	-0.07	-0.03	-0.00	0.01	0.03
<i>Acer saccharinum</i> ,Chill 6 Wks	0.01	-0.03	-0.01	-0.00	0.02	0.05	0.08
<i>Alnus incana rugosa</i> ,Chill 6 Wks	-0.01	-0.06	-0.04	-0.01	0.00	0.02	0.04
<i>Betula papyrifera</i> ,Chill 6 Wks	-0.00	-0.05	-0.03	-0.01	0.01	0.03	0.05
<i>Betula populifolia</i> ,Chill 6 Wks	-0.00	-0.05	-0.03	-0.01	0.01	0.03	0.05
<i>Cornus racemosa</i> ,Chill 6 Wks	-0.01	-0.07	-0.04	-0.02	0.00	0.02	0.04
<i>Salix purpurea</i> ,Chill 6 Wks	0.01	-0.04	-0.02	-0.00	0.01	0.04	0.07
<i>Sorbus americana</i> ,Chill 6 Wks	-0.01	-0.07	-0.05	-0.02	0.00	0.02	0.03
<i>Viburnum dentatum</i> ,Chill 6 Wks	0.01	-0.04	-0.02	-0.00	0.02	0.05	0.07
<i>Acer saccharinum</i> ,Chill 8 Wks	0.02	-0.03	-0.01	0.00	0.04	0.07	0.10
<i>Alnus incana rugosa</i> ,Chill 8 Wks	-0.02	-0.09	-0.06	-0.03	0.00	0.02	0.04
<i>Betula papyrifera</i> ,Chill 8 Wks	-0.02	-0.09	-0.06	-0.03	-0.00	0.02	0.04
<i>Betula populifolia</i> ,Chill 8 Wks	-0.01	-0.08	-0.06	-0.03	0.00	0.02	0.05
<i>Cornus racemosa</i> ,Chill 8 Wks	-0.00	-0.07	-0.04	-0.02	0.01	0.04	0.06
<i>Salix purpurea</i> ,Chill 8 Wks	0.02	-0.04	-0.02	0.00	0.04	0.07	0.10
<i>Sorbus americana</i> ,Chill 8 Wks	-0.02	-0.10	-0.08	-0.04	-0.00	0.01	0.03
<i>Viburnum dentatum</i> ,Chill 8 Wks	0.03	-0.03	-0.01	0.01	0.05	0.08	0.11
<i>Acer saccharinum</i> ,Tx:Chill 6 Wks	0.01	-0.05	-0.03	-0.00	0.01	0.05	0.08
<i>Alnus incana rugosa</i> ,Tx:Chill 6 Wks	-0.01	-0.08	-0.04	-0.01	0.00	0.02	0.05
<i>Betula papyrifera</i> ,Tx:Chill 6 Wks	-0.00	-0.08	-0.04	-0.01	0.01	0.03	0.05
<i>Betula populifolia</i> ,Tx:Chill 6 Wks	0.01	-0.04	-0.02	-0.00	0.02	0.05	0.08
<i>Cornus racemosa</i> ,Tx:Chill 6 Wks	0.00	-0.05	-0.03	-0.01	0.01	0.04	0.08
<i>Salix purpurea</i> ,Tx:Chill 6 Wks	0.00	-0.06	-0.03	-0.01	0.01	0.04	0.07
<i>Sorbus americana</i> ,Tx:Chill 6 Wks	-0.01	-0.10	-0.06	-0.02	0.00	0.02	0.03
<i>Viburnum dentatum</i> ,Tx:Chill 6 Wks	0.00	-0.06	-0.04	-0.01	0.01	0.04	0.07
<i>Acer saccharinum</i> ,Tx:Chill 8 Wks	0.01	-0.04	-0.02	-0.00	0.02	0.05	0.09

Table S9: Summary of model with the effects of false spring treatment and chilling duration across species on leaf toughness.

	mean	2%	10%	25%	75%	90%	98%
<i>Alnus incana rugosa</i> ,Tx:Chill 8 Wks	-0.00	-0.06	-0.04	-0.01	0.01	0.03	0.06
<i>Betula papyrifera</i> ,Tx:Chill 8 Wks	-0.00	-0.07	-0.04	-0.01	0.00	0.03	0.05
<i>Betula populifolia</i> ,Tx:Chill 8 Wks	-0.00	-0.07	-0.04	-0.01	0.01	0.03	0.05
<i>Cornus racemosa</i> ,Tx:Chill 8 Wks	0.00	-0.06	-0.03	-0.01	0.01	0.04	0.06
<i>Salix purpurea</i> ,Tx:Chill 8 Wks	-0.00	-0.07	-0.04	-0.01	0.01	0.03	0.06
<i>Sorbus americana</i> ,Tx:Chill 8 Wks	-0.00	-0.06	-0.04	-0.01	0.01	0.03	0.06

Table S10: Summary of model with the effects of false spring treatment and chilling duration across species on leaf thickness.

	mean	2%	10%	25%	75%	90%	98%
Intercept	141.76	119.08	125.87	135.57	147.79	158.06	166.29
Tx	-8.90	-17.68	-15.08	-11.29	-6.46	-2.75	0.29
Chill 6 Wks	7.21	-9.50	-3.49	3.16	11.24	17.94	23.06
Chill 8 Wks	-8.38	-27.21	-20.39	-12.84	-3.67	3.68	9.06
Tx:Chill 6 Wks	-1.81	-14.56	-10.56	-5.25	1.68	6.78	10.78
Tx:Chill 8 Wks	1.50	-10.93	-7.19	-2.04	5.03	9.99	13.30
Intercept	136.92	115.60	122.45	131.52	142.58	151.41	159.60
<i>Acer saccharinum</i> ,Intercept	-31.97	-57.43	-49.47	-38.60	-25.14	-15.13	-7.93
<i>Alnus incana rugosa</i> ,Intercept	17.84	-7.75	0.82	11.24	24.62	34.74	42.97
<i>Betula papyrifera</i> ,Intercept	32.87	6.91	15.56	26.19	39.61	49.87	58.26
<i>Betula populifolia</i> ,Intercept	10.53	-15.48	-6.66	3.71	17.31	27.75	35.83
<i>Cornus racemosa</i> ,Intercept	-8.65	-33.93	-25.99	-15.17	-1.72	8.17	15.86
<i>Salix purpurea</i> ,Intercept	16.74	-9.31	-0.19	10.08	23.41	34.04	41.29
<i>Sorbus americana</i> ,Intercept	-29.77	-56.70	-47.34	-36.39	-23.02	-12.81	-5.32
<i>Viburnum dentatum</i> ,Intercept	-5.16	-30.61	-22.12	-11.83	1.62	11.95	19.40
<i>Acer saccharinum</i> ,Tx	0.88	-7.11	-4.07	-0.74	2.30	7.03	11.52
<i>Alnus incana rugosa</i> ,Tx	-2.29	-15.60	-10.07	-3.77	0.06	1.94	3.94
<i>Betula papyrifera</i> ,Tx	0.77	-7.33	-3.99	-0.85	2.11	6.87	11.80
<i>Betula populifolia</i> ,Tx	-0.08	-9.56	-5.28	-1.47	1.27	5.04	9.39
<i>Cornus racemosa</i> ,Tx	-0.24	-9.94	-5.76	-1.52	1.19	4.76	8.35
<i>Salix purpurea</i> ,Tx	-0.59	-10.53	-6.32	-1.88	0.86	4.35	7.42
<i>Sorbus americana</i> ,Tx	1.02	-7.19	-4.10	-0.69	2.53	7.48	11.78
<i>Viburnum dentatum</i> ,Tx	0.12	-8.94	-4.91	-1.21	1.40	5.24	8.93
<i>Acer saccharinum</i> ,Chill 6 Wks	-8.97	-31.35	-23.41	-14.20	-3.20	3.73	9.01
<i>Alnus incana rugosa</i> ,Chill 6 Wks	-3.16	-23.21	-16.74	-8.17	1.84	9.89	16.49
<i>Betula papyrifera</i> ,Chill 6 Wks	1.27	-18.39	-11.65	-3.65	6.26	14.48	21.76
<i>Betula populifolia</i> ,Chill 6 Wks	-1.18	-21.11	-14.59	-6.33	3.91	11.89	18.35
<i>Cornus racemosa</i> ,Chill 6 Wks	16.15	-2.21	2.08	9.80	21.75	31.67	39.11
<i>Salix purpurea</i> ,Chill 6 Wks	-12.29	-34.05	-26.76	-17.63	-6.61	0.61	6.97
<i>Sorbus americana</i> ,Chill 6 Wks	10.65	-8.06	-2.47	4.73	16.11	25.45	32.65
<i>Viburnum dentatum</i> ,Chill 6 Wks	-1.53	-21.85	-15.15	-6.64	3.57	11.59	17.73
<i>Acer saccharinum</i> ,Chill 8 Wks	4.24	-16.95	-10.58	-1.50	10.03	19.20	26.80
<i>Alnus incana rugosa</i> ,Chill 8 Wks	-10.03	-31.69	-25.10	-16.00	-4.07	4.54	11.62
<i>Betula papyrifera</i> ,Chill 8 Wks	-5.74	-27.24	-19.93	-11.22	-0.32	8.41	15.98
<i>Betula populifolia</i> ,Chill 8 Wks	-19.37	-42.43	-35.14	-25.05	-13.25	-5.02	1.43
<i>Cornus racemosa</i> ,Chill 8 Wks	-3.79	-26.10	-18.62	-9.55	1.87	10.72	18.91
<i>Salix purpurea</i> ,Chill 8 Wks	0.31	-21.05	-14.02	-5.52	5.79	15.18	23.32
<i>Sorbus americana</i> ,Chill 8 Wks	19.74	-1.14	4.96	13.32	25.66	35.62	44.76
<i>Viburnum dentatum</i> ,Chill 8 Wks	14.47	-5.66	0.51	8.22	20.01	30.14	38.72
<i>Acer saccharinum</i> ,Tx:Chill 6 Wks	0.81	-12.64	-6.83	-1.36	2.79	9.69	16.74
<i>Alnus incana rugosa</i> ,Tx:Chill 6 Wks	-0.97	-15.84	-9.20	-2.87	1.03	5.61	11.59
<i>Betula papyrifera</i> ,Tx:Chill 6 Wks	0.45	-12.44	-6.54	-1.66	2.29	8.77	15.03
<i>Betula populifolia</i> ,Tx:Chill 6 Wks	-0.94	-15.56	-9.50	-2.85	1.18	6.01	11.86
<i>Cornus racemosa</i> ,Tx:Chill 6 Wks	-2.00	-19.11	-11.82	-3.90	0.53	4.34	8.85
<i>Salix purpurea</i> ,Tx:Chill 6 Wks	-0.26	-14.53	-8.21	-2.09	1.70	7.27	12.87
<i>Sorbus americana</i> ,Tx:Chill 6 Wks	0.77	-12.93	-7.16	-1.30	2.80	9.33	16.07
<i>Viburnum dentatum</i> ,Tx:Chill 6 Wks	1.89	-8.77	-4.22	-0.56	3.74	11.17	18.71
<i>Acer saccharinum</i> ,Tx:Chill 8 Wks	0.96	-11.32	-5.80	-1.16	2.76	9.34	15.71

Table S10: Summary of model with the effects of false spring treatment and chilling duration across species on leaf thickness.

	mean	2%	10%	25%	75%	90%	98%
<i>Alnus incana rugosa</i> ,Tx:Chill 8 Wks	-0.12	-12.38	-7.28	-1.83	1.51	6.96	13.25
<i>Betula papyrifera</i> ,Tx:Chill 8 Wks	-0.47	-14.03	-8.09	-2.20	1.32	6.43	12.10
<i>Betula populifolia</i> ,Tx:Chill 8 Wks	-0.49	-14.26	-8.03	-2.23	1.35	6.36	11.45
<i>Cornus racemosa</i> ,Tx:Chill 8 Wks	0.86	-9.85	-5.64	-1.08	2.41	8.93	14.88
<i>Salix purpurea</i> ,Tx:Chill 8 Wks	-1.35	-15.85	-10.16	-3.04	0.69	4.85	9.36
<i>Sorbus americana</i> ,Tx:Chill 8 Wks	1.31	-10.34	-5.38	-0.88	3.13	10.00	16.75

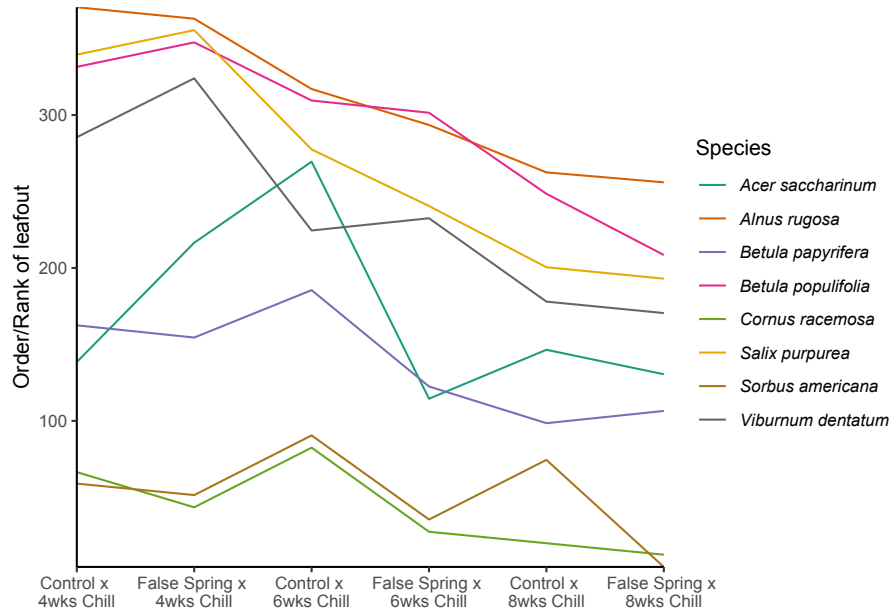


Figure S3: Understanding rank order of leafout across all species using (a) mean trends and (b) raw estimates.