

Supporting Information: Seedling competition between two native  
and invasive woodland herb species is mediated by relative  
germination timing

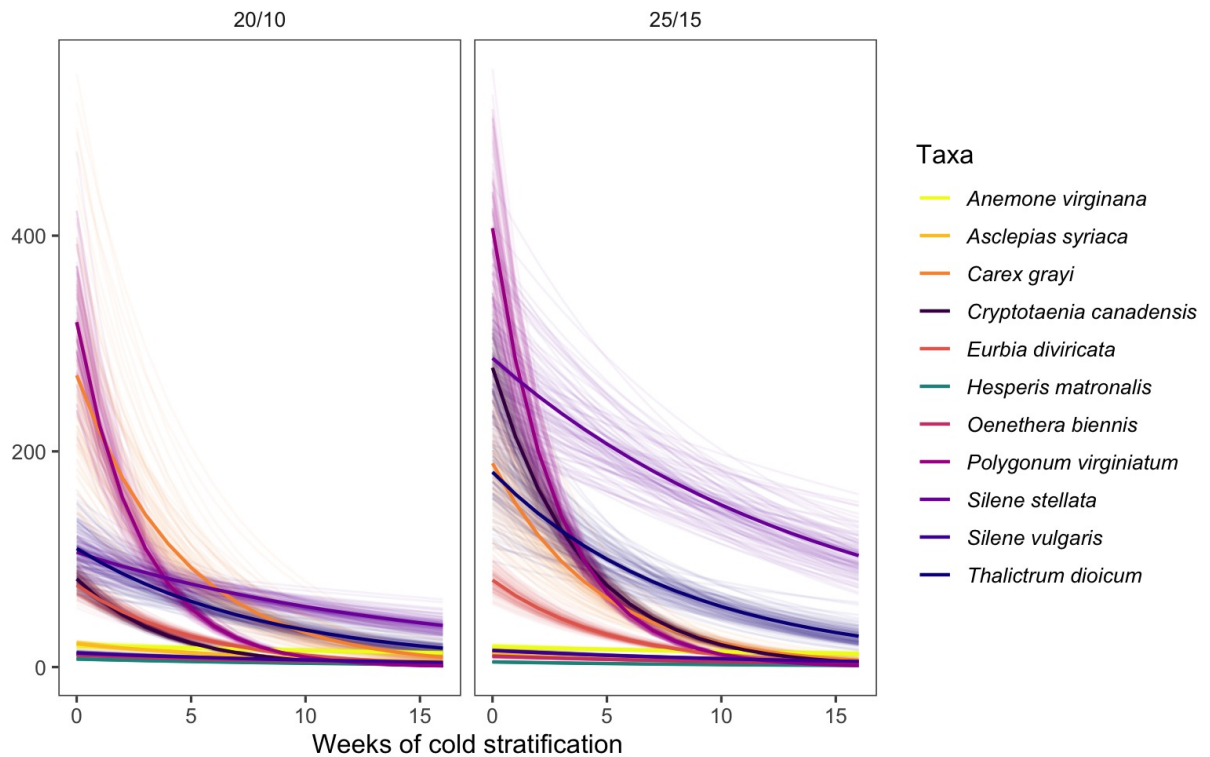


Figure S1: The effects of weeks of cold stratification at 4C on the time to 50% germination of 11 herbaceous perennials under a) cool and b) warm (20/10C vs. 25/15C day/night) incubation conditions, estimated with accelerated failure time model. The solid lines indicated indicated the mean estimate, while lighter line depict uncertainty with 100 random draws from the posterior distribution.

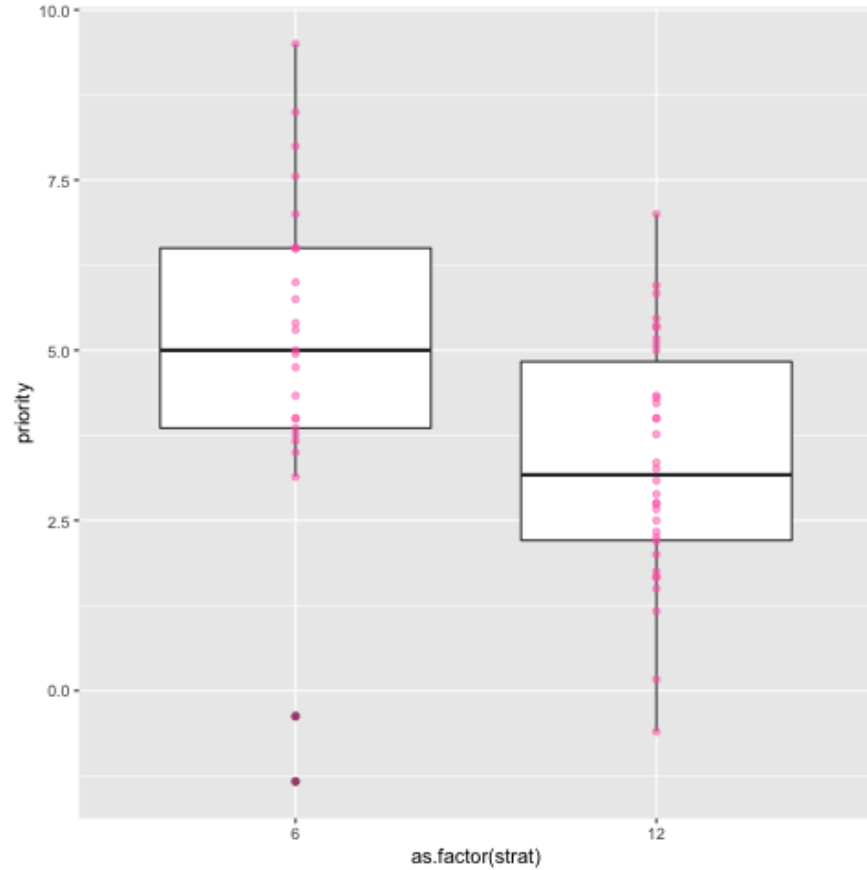


Figure S2: Differences in mean germination time between *Hesperis matronalis* and *C. canadensis* under 6 and 12 weeks of cold stratification.

## Measures of germination speed

There are important differences between time to 50% germination (t50) and mean germination time (MGT) that make one or the other more appropriate for the two types of experiments we ran. t50 is an estimate of the time to 50% germination of all seeds planted, while mean germinating time (MGT) is a measure of the time to 50% germination of only individuals that actually germinated (Soltani *et al.*, 2015). In comparative germination assays, t50 is a better metric because it is standardized phenological estimates across variable germination fractions. In our competition trials it would not have made sense to account for the germination speed of individuals that did not germinate, because only germinated individuals were influencing the competitive dynamics of our species. Because MGT is sensitive to the final germination fraction, it is not surprising the MGT measurements in the competition trials were lower than the t50 estimates in the germination assays.

species	seed source	status
<i>Anemone virginiana</i>	Prairie Moon	native
<i>Asclepias syriaca</i>	Toadshade	native
<i>Carex grayi</i>	Prairie Moon	native
<i>Cryptotaenia canadensis</i>	Prairie Moon	native
<i>Eurybia divaricata</i>	Toadshade	native
<i>Hesperis matronalis</i>	American Meadows	invasive
<i>Oenothera biennis</i>	Toadshade	native
<i>Persicaria virginiana</i>	Prairie Moon	native
<i>Silene stellata</i>	Prairie Moon	native
<i>Silene vulgaris</i>	wild collected	invasive
<i>Thalictrum diocicum</i>	Prairie Moon	native

Table S1: Species information for germination assays. Seed were source from a) Prairie Moon Nursery, Winona, MN b) Toadshade Wildflower Farm, Frenchtown, NJ, c) American Meadows, Shelburne VT, or d) wild collected in unmanaged section of the Arnold Arboretum, Boston MA.

## References

Soltani, E., Ghaderi-Far, F., Baskin, C.C. & Baskin, J.M. (2015) Problems with using mean germination time to calculate rate of seed germination. *Australian Journal of Botany* **63**, 631–635.

Stratification	Incubation	Max germination (%)		Mean germination time (days)	
		C. canadensis	H. matronalis	C. canadensis	H. matronalis
0	H	0.07 (0.1)	0.78 (0)	15.25 (0)	3.11 (0.6)
	L	0 (0)	0.75 (0.1)	—	4.59 (0.7)
2	H	0.03 (0)	1 (0)	9 (1)	2.3 (0.1)
	L	0.2 (0.2)	0.82 (0.1)	10.25 (0.3)	2.57 (0.5)
4	H	0.18 (0.1)	0.97 (0)	9.83 (3.6)	2.49 (0.3)
	L	0.58 (0.3)	0.82 (0.1)	11.06 (1.1)	3.5 (0.6)
5	H	0.08 (0.1)	1 (0)	8.44 (4.7)	2.33 (0.4)
	L	0.85 (0.1)	0.9 (0.1)	7.67 (0.5)	2.62 (0.6)
6	H	0.25 (0.2)	0.98 (0)	13.5 (6.9)	1.91 (0.2)
	L	0.77 (0.1)	0.97 (0.1)	8.11 (0.4)	2.14 (0.2)
7	H	0.6 (0)	0.87 (0)	5.81 (0.2)	2 (0)
	L	0.97 (0.1)	1 (0)	6.29 (0.2)	2.15 (0.2)
8	H	0.5 (0.1)	1 (0)	7.4 (0.3)	2.06 (0.2)
	L	0.98 (0)	0.95 (0)	6.09 (0.4)	1.94 (0.1)
9	H	0.6 (0.1)	0.98 (0)	5.22 (0.7)	1.74 (0.1)
	L	1 (0)	0.93 (0.1)	6.04 (0.5)	1.78 (0)
11	H	0.73 (0.2)	0.98 (0)	4.61 (0.2)	1.86 (0.1)
	L	0.93 (0.1)	0.93 (0.1)	5.04 (0.3)	2.11 (0.5)
13	H	0.77 (0.2)	0.88 (0)	4.14 (0.3)	1.89 (0.9)
	L	1 (0)	0.98 (0)	4.16 (0.2)	1.42 (0.3)

Table S2: Max germination percentages and mean germination time for our species under all experimental treatment combination. H/L incubation (25 or 20C) and weeks of chilling

	Estimate	Est.Error	Q2.5	Q25	Q75	Q97.5
Intercept	2.59	0.25	2.10	2.41	2.76	3.09
n_Cc	-0.41	0.03	-0.47	-0.43	-0.38	-0.34
n_Hm	0.12	0.03	0.07	0.11	0.14	0.17
priority	0.15	0.03	0.08	0.13	0.17	0.21

Table S3: Estimates from the RGRD models