Given our large number of sites with genetically identical individuals, we looked for an environmental cue that maximized narrow-sense heritability within or across subpopulations and common garden sites. Our reasoning was that, if a flowering time phenotype, as defined by a particular environmental cue, had higher heritability, it is more likely that there is detectable genetic variation segregating for that cue’s role in flowering. Ideally, heritability when defining flowering using a specific cue should be higher than heritability using Julian date; otherwise, it makes little sense to use the cue for genomic prediction. We looked at heritability for nine traits associated with 50% flowering: daylength (analogous for a critical daylength for flowering), Julian date, cumulative GDD between greenup and flowering, the change in daylength from the previous day at flowering, and five measures of cumulative rainfall: cumulative rainfall between greenup and flowering, and in the two days, three days, five days, and seven days before flowering.

For the model with both Gulf and Midwest subpopulations at eight common garden sites, the four cumulative rainfall measures in the few days immediately preceding flowering had the highest heritability (>0.948 +/- 0.02), followed by the change in daylength (0.948 +/0.012), followed by cumulative rainfall (0.93 +/0 0.015). These cues were the only cues that had higher heritability than Julian date.

For the Gulf subpopulation at eight common garden sites, daylength had the highest heritability (0.336 +/- 0.073) and was the only cue that had higher heritability than Julian date. In contrast, the Midwest subpopulation at eight common garden sites had the highest heritability for cumulative GDD (0.368 +/- 0.052). Both cumulative GDD and daylength (0.144 +/- 0.052) had higher heritabilities than Julian date.

Heritabilities for these phenotypes varied across individual common garden sites.

At gardens within the range of Gulf subpopulations latitudes of origin, heritabilities for flowering were highest for CGDD, daylength, and cumulative rainfall between greenup and flowering. Outside of the range of Gulf subpopulation, heritabilities were highest for daylength change, 2d cumulative rainfall.

At all common gardens, heritabilities for the Midwest subpopulation were high for cumulative GDD. Daylength change and daylength both had high heritabilities for individual common gardens but not for all sites modelled together.

Across both subpopulations within sites, daylength change proved the most reliably high heritability trait. At the northern six sites, this trait was higher heritability than Julian date. At the southern two Texas sites, CGDD and cumulative

Across all eight sites within subpopulations, greenup date had extremely low heritability (0.005 +/- 0.003 Gulf; 0.021 +/0 0.011 for Midwest). (model GR50 as a function of cumulative GDD from January 1st to GR50 – see if this does better. I hope/bet it will).