

**WORKING SMARTER, NOT HARDER:
MORE PRECISE (PHENOLOGICAL)
DATA ARE NOT ALWAYS BETTER**



**Katie D.
Pearson**

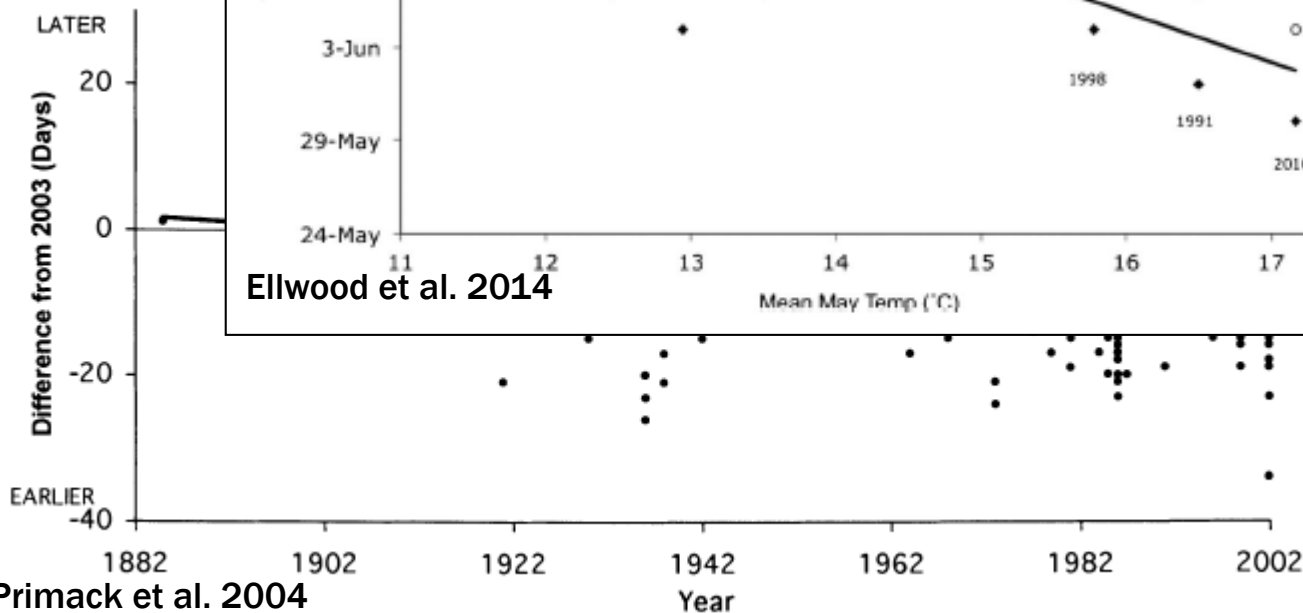
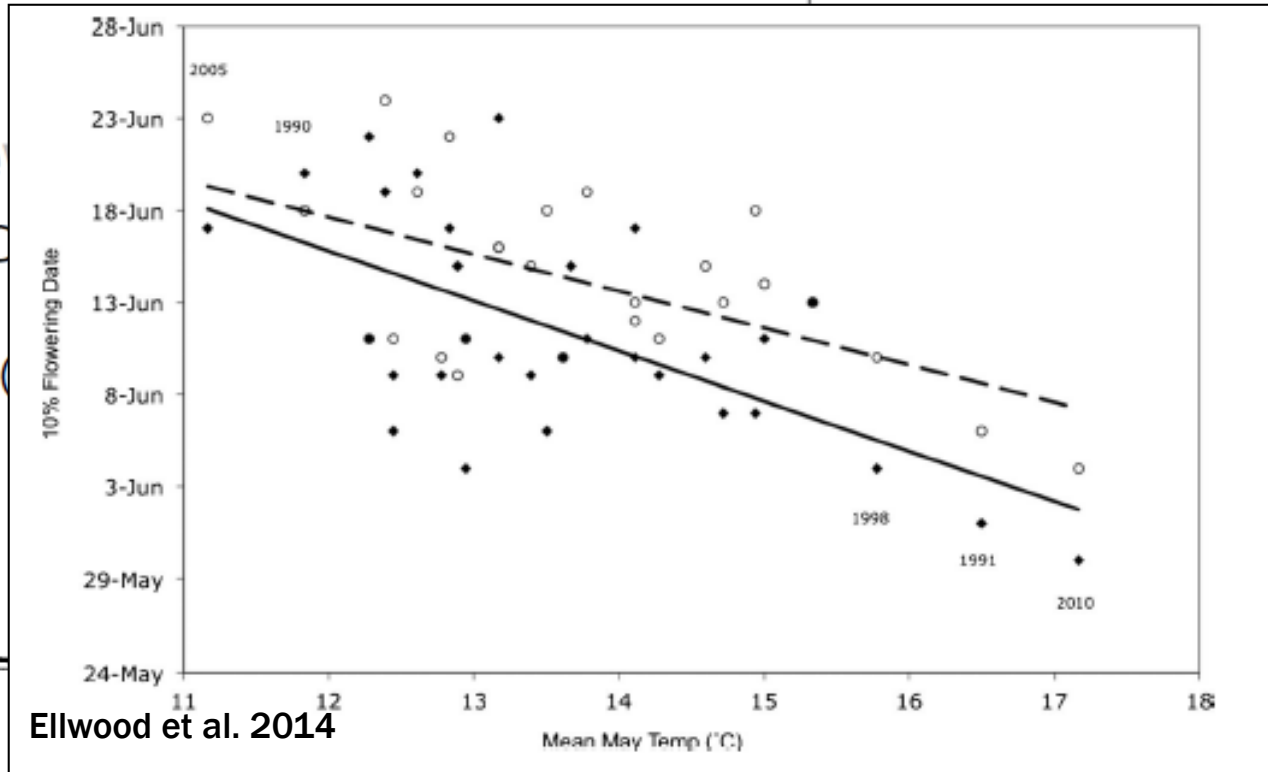
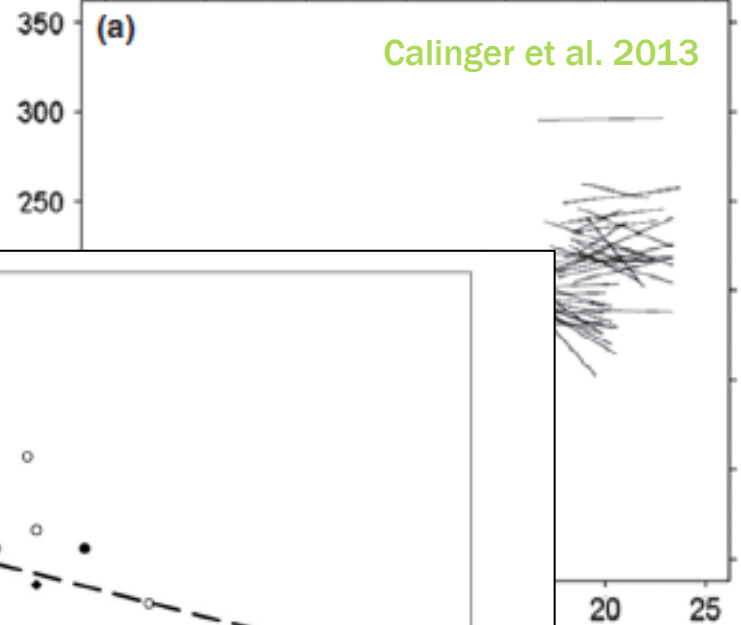
CAL POLY
SAN LUIS OBISPO





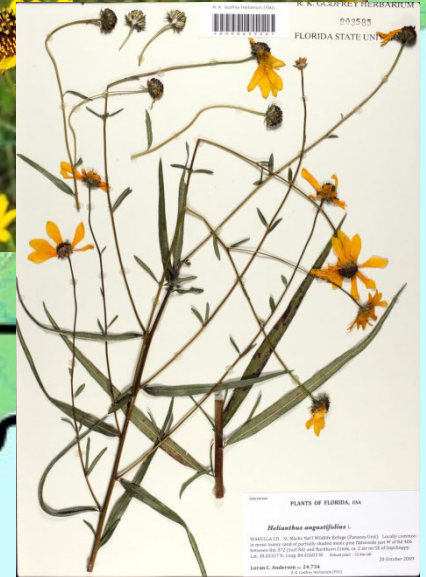
Trends in Ecology & Evolution

Review Old P Phen



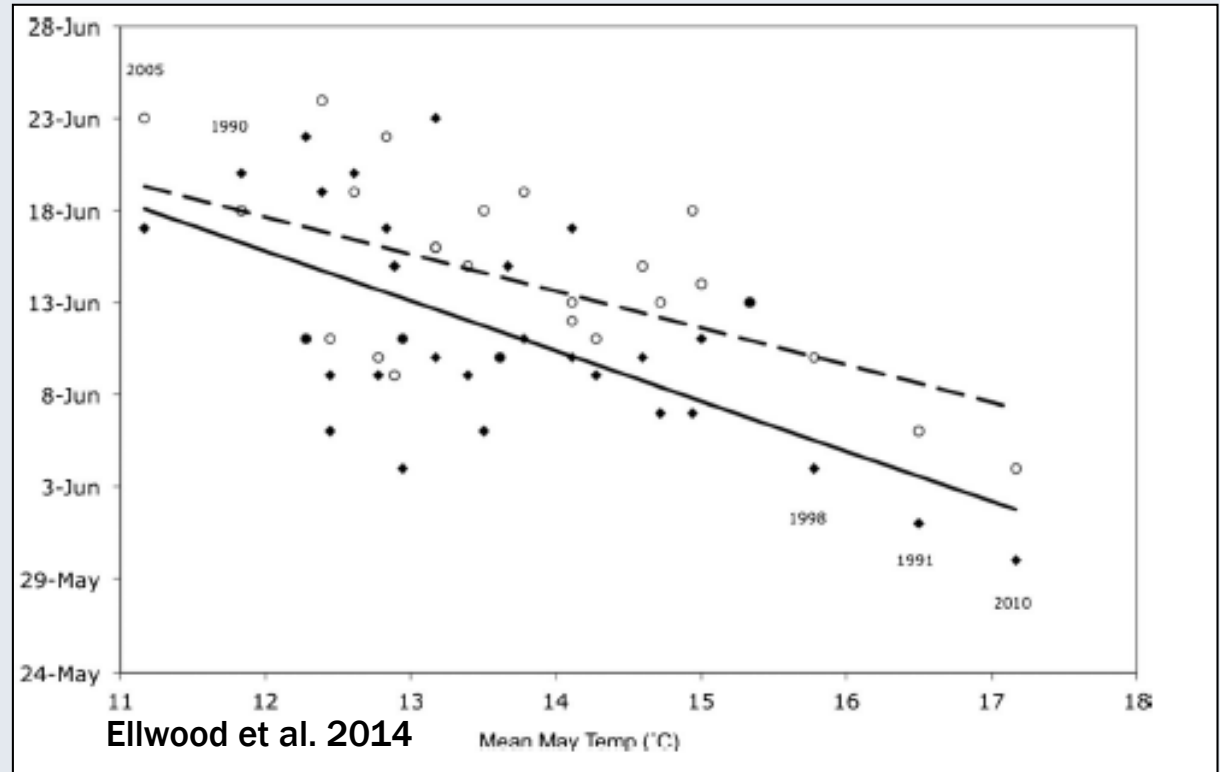


United States of America



Mexico

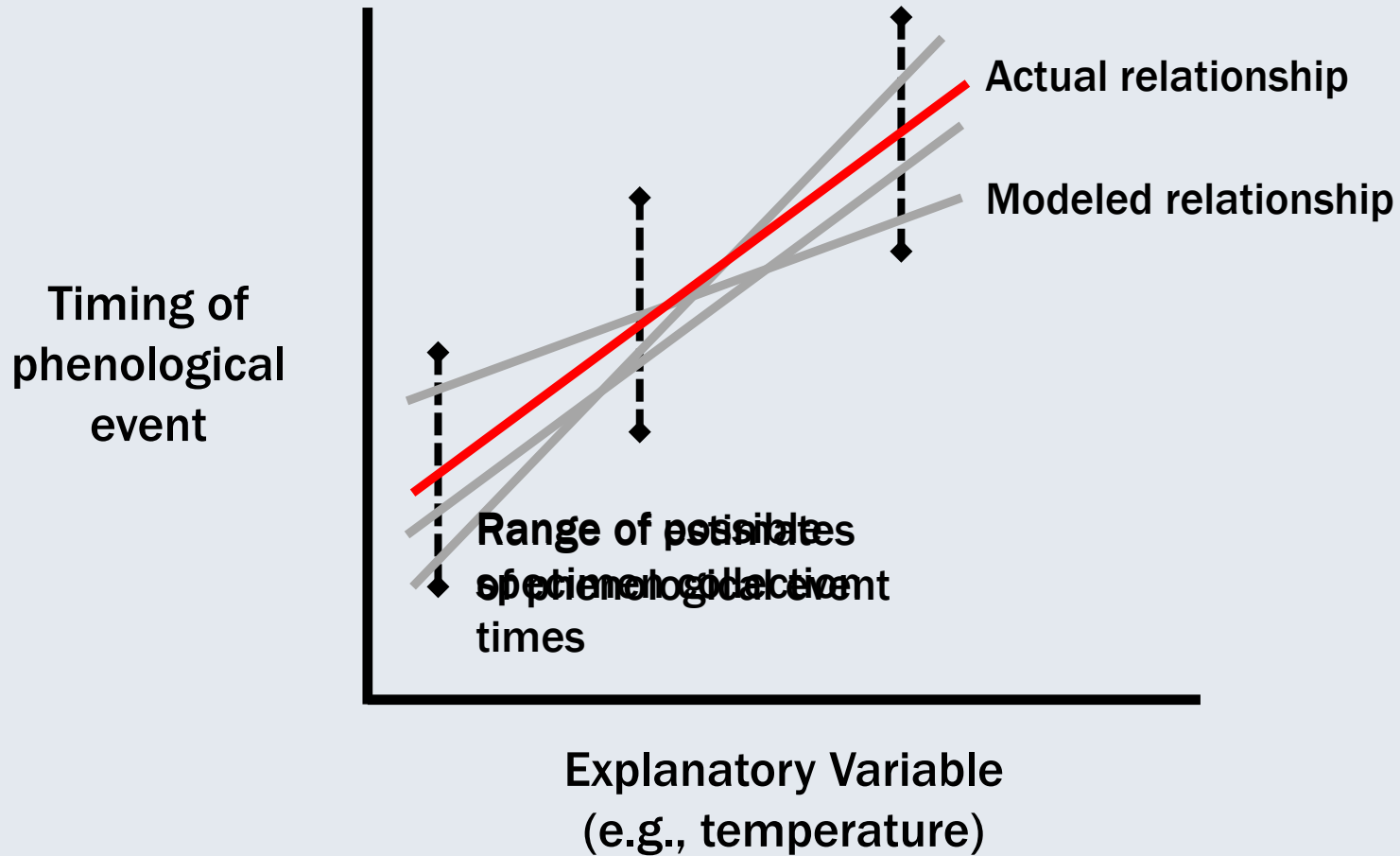
“Flowering time”
=
Collection date





Binary method

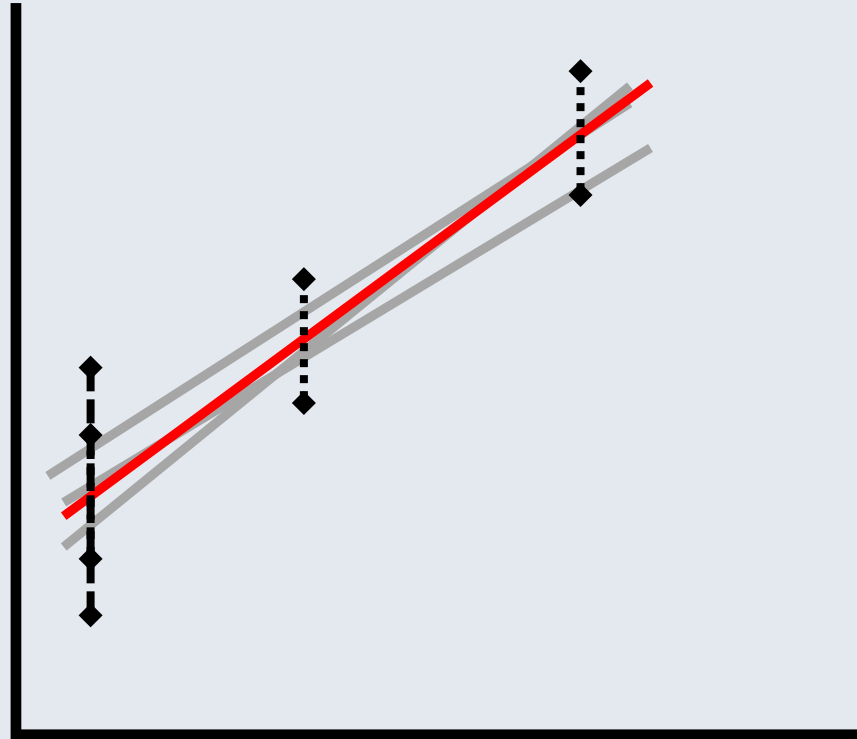
64%



Binary method

Potentially imprecise and inaccurate

Timing of phenological event

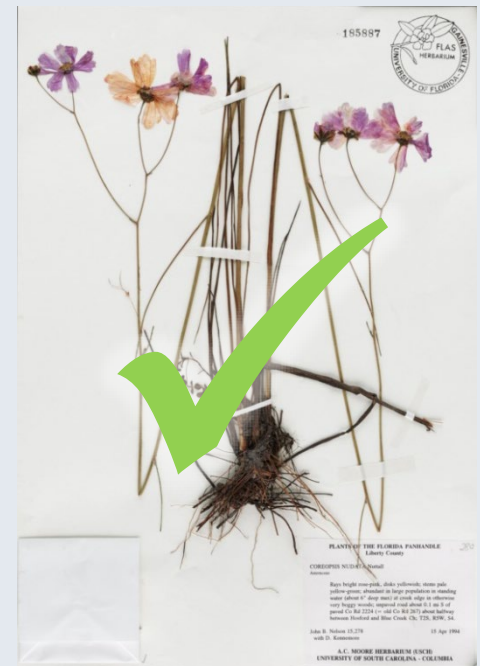


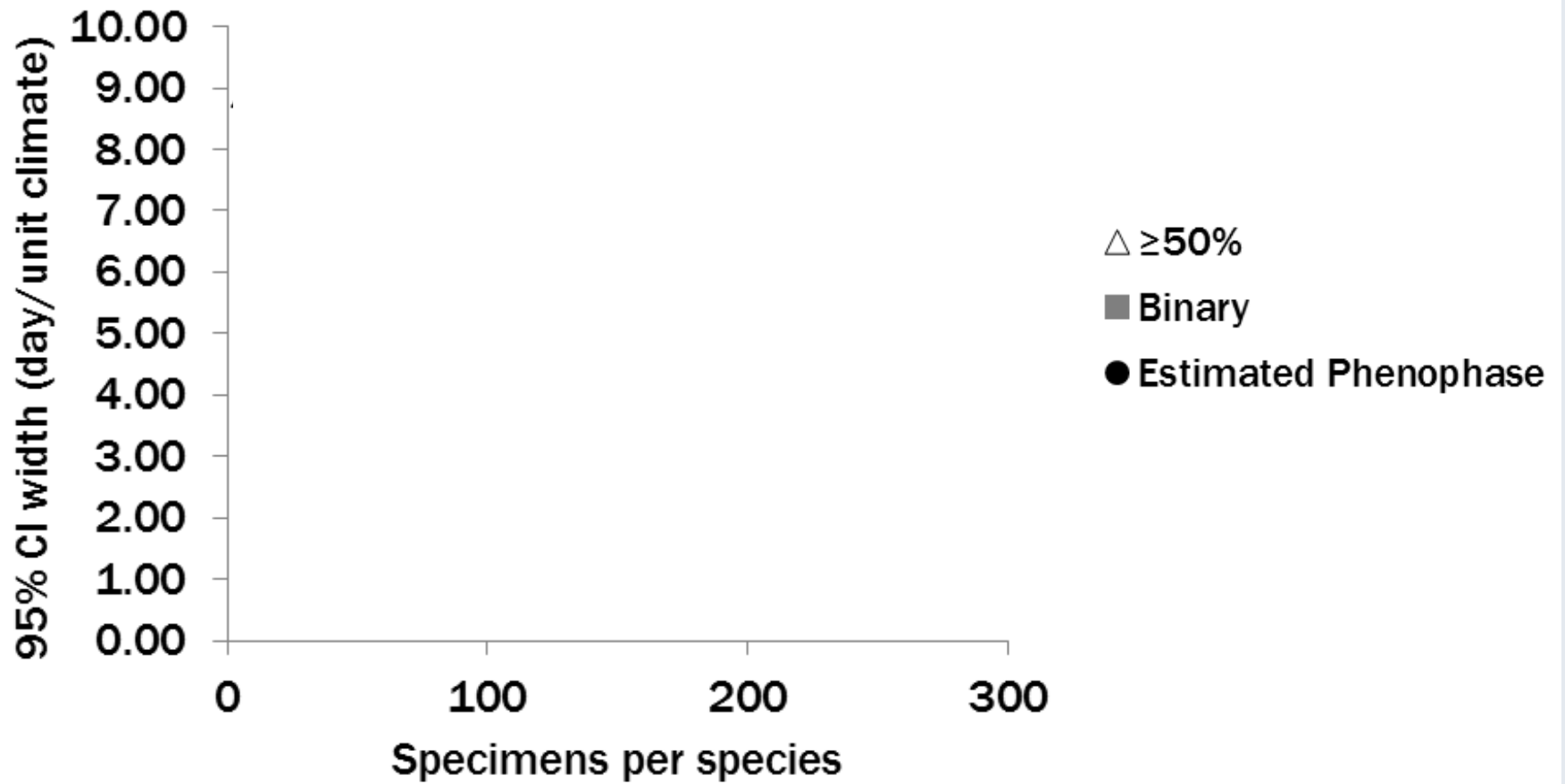
Explanatory Variable
(e.g., temperature)

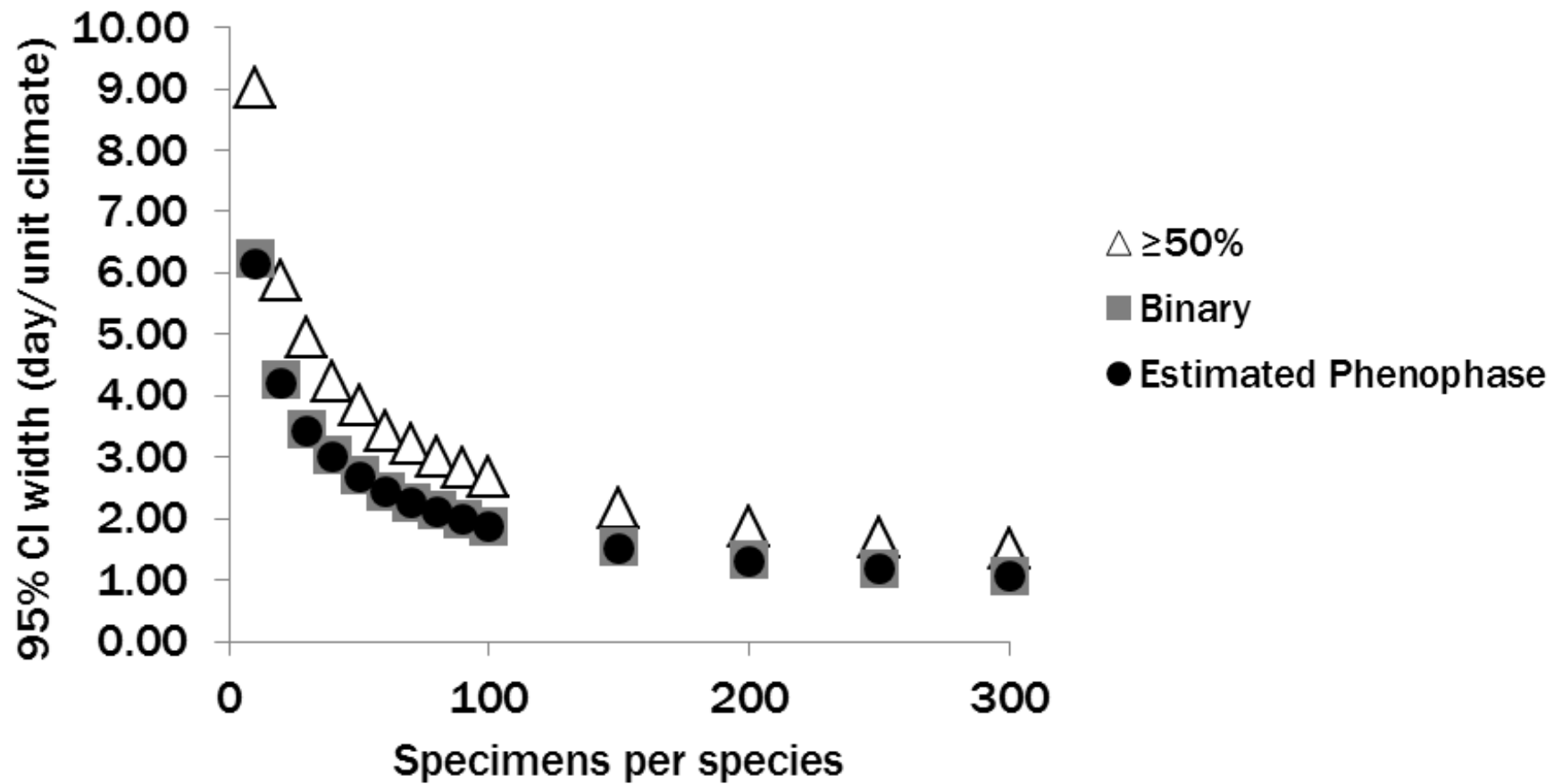
≥50% method

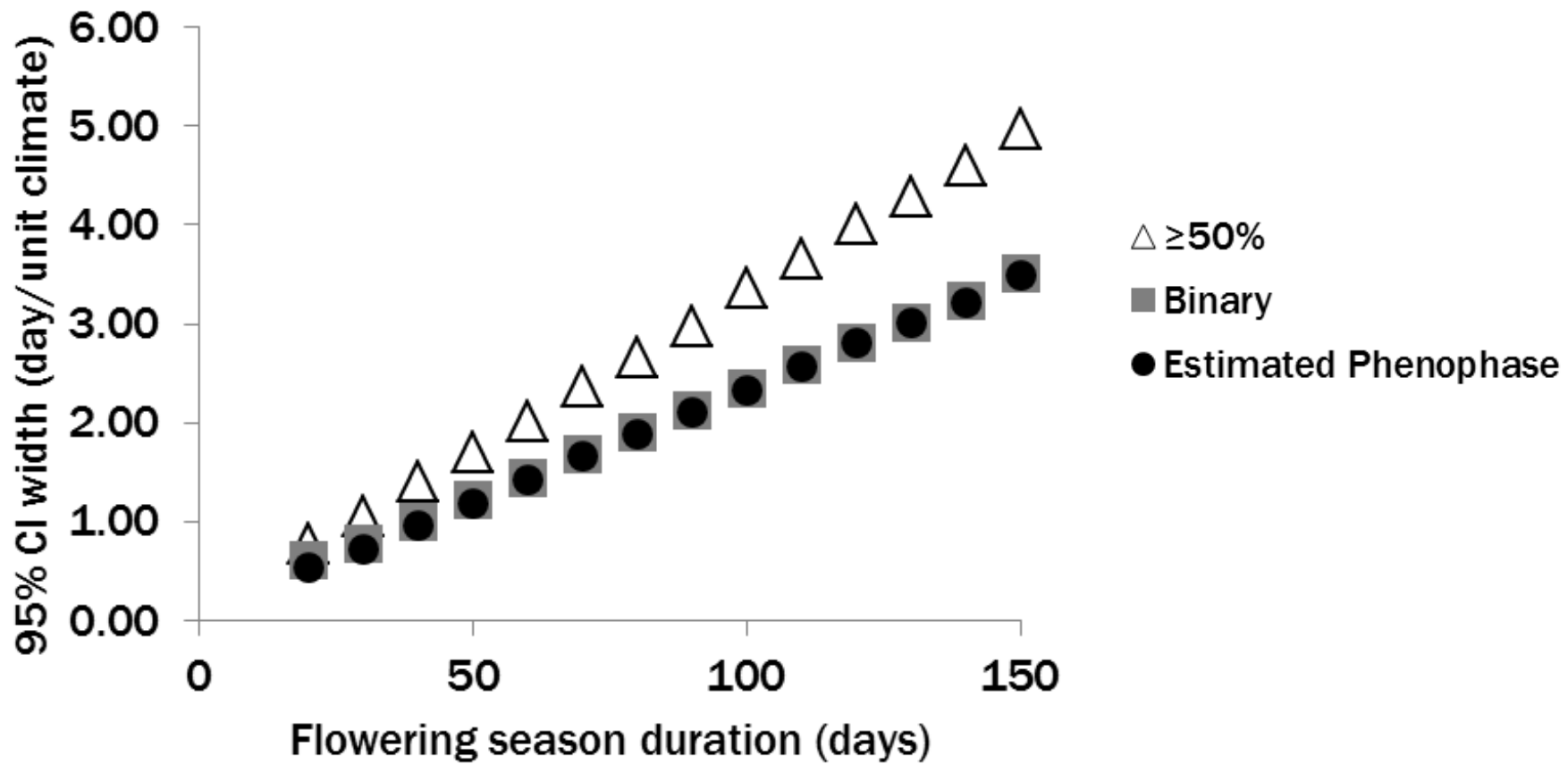
14%

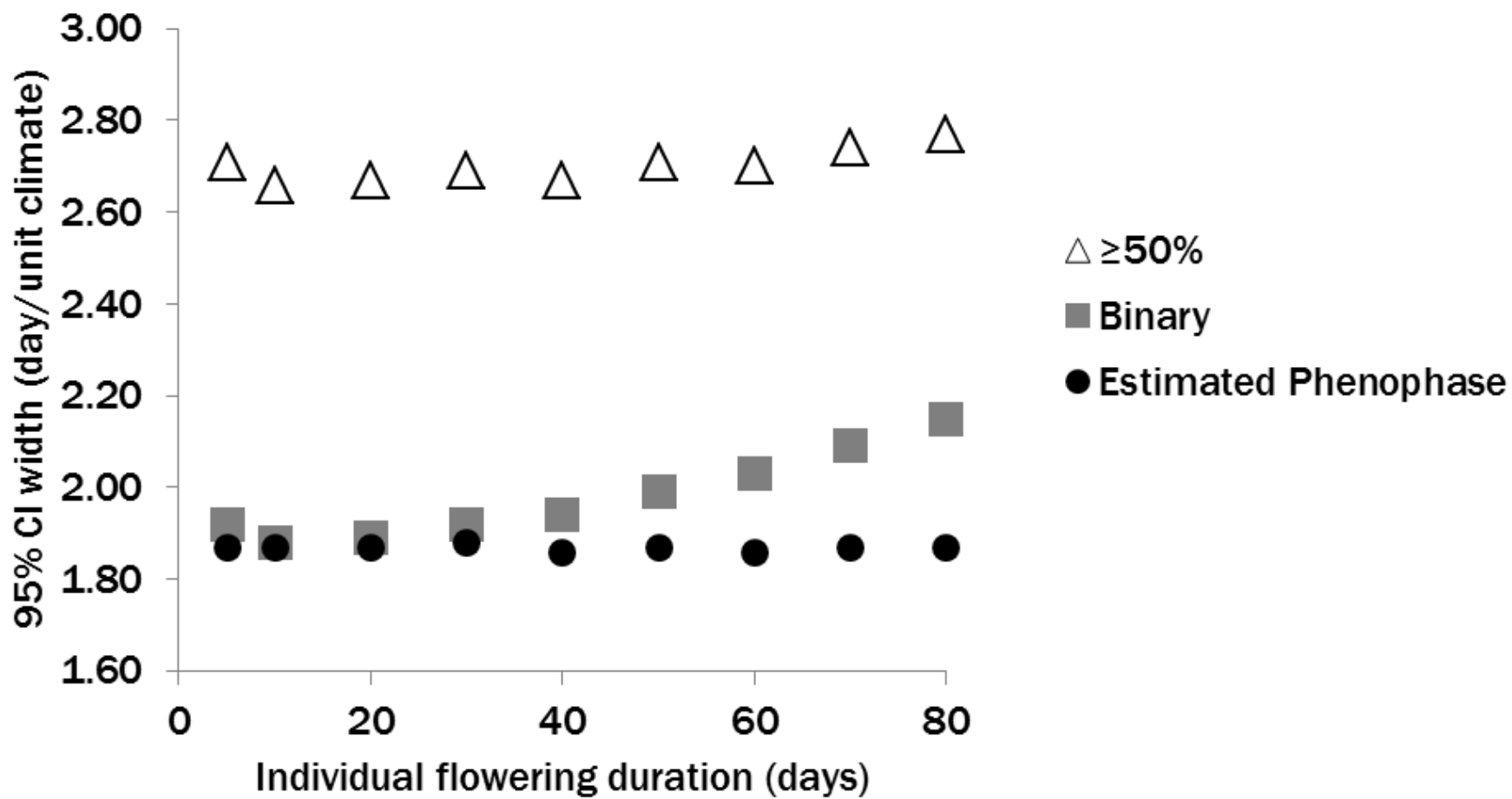
Limits sample size












ELLWOOD ET AL. 2019

Phenology models using herbarium specimens are only slightly improved by using finer-scale stages of reproduction

Elizabeth R. Ellwood^{1,6} , Richard B. Primack², Charles G. Willis^{3,4}, and Janneke HilleRisLambers^{5,6}



 Applications
in Plant Sciences



ELLWOOD ET AL. 2019

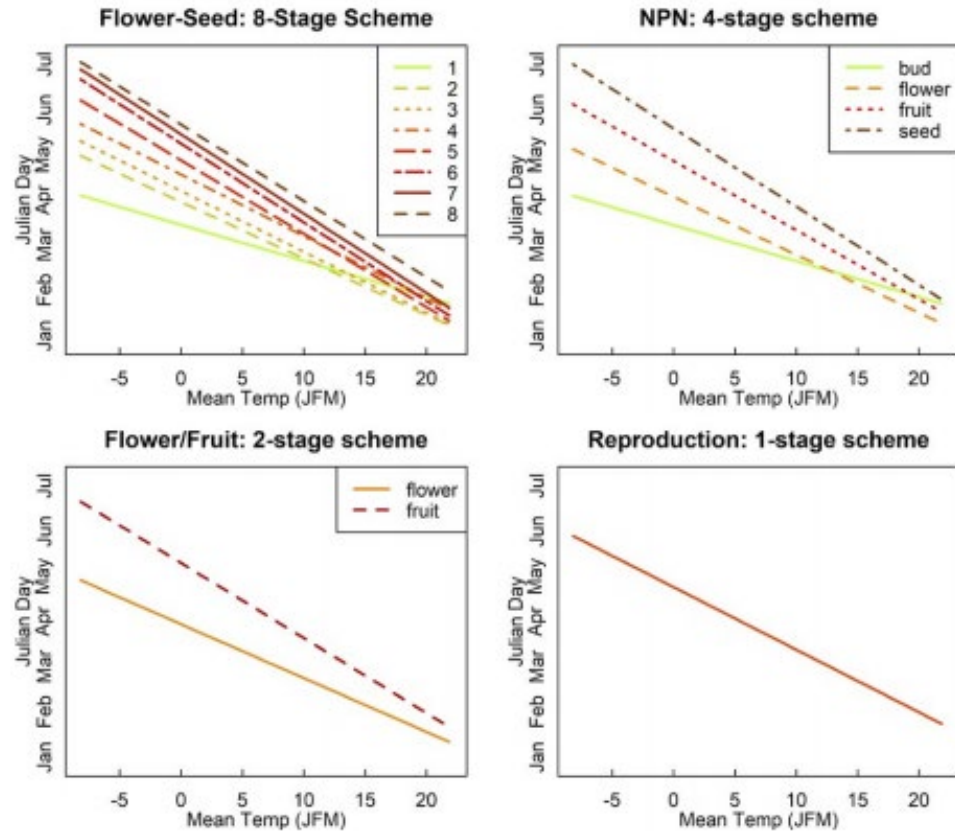
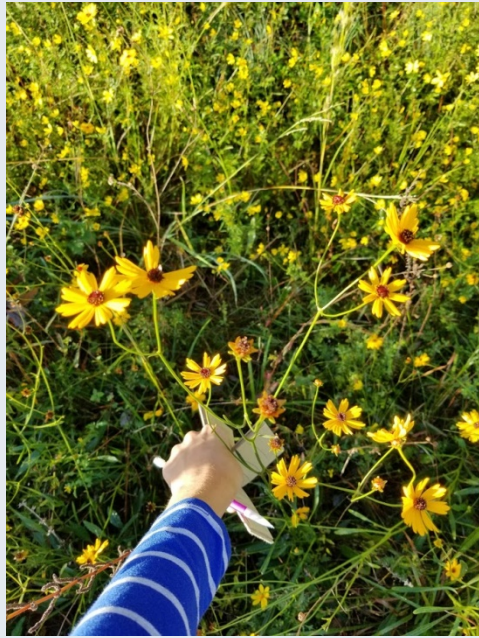


FIGURE 3. Relationship between mean January, February, and March temperatures (JFM) and the collection dates of herbarium specimens with reproductive structures, according to one of the four classification schemes. The slope of each line represents the effect that warmer spring temperatures have on the timing of reproductive phenology. NPN = USA National Phenology Network.



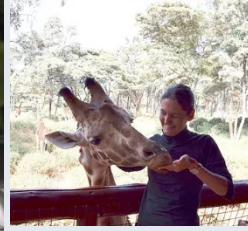
CONCLUSIONS

- **Precise phenological data may not be necessary to answer basic questions about phenology and climate change**
- **Models are powerful tools not just for making biological predictions, but also for making predictions about how appropriate our methods are for our questions.**
 - **This is old news, but it still needs to be repeated.**
- **Education about these tools is vital for efficient research, especially for beginning scientists.**



THANK YOU!

- Austin Mast
- Gil Nelson
- Libby Ellwood
- Scott Burgess
- Greg Riccardi



Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the National Science Foundation.

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