Forecasting future biological responses to climate change: why photoperiod matters
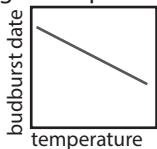
Observational climate & biological data (e.g., phenology)

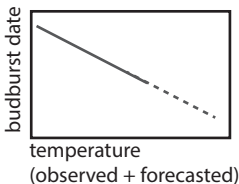| year	day of year	temperature
1901	90	12
1902	95	13.5
1903	88	11.8
1904	100	14
...	...	...

Experimental data with temperature & photoperiod

Common approach (without photoperiod)

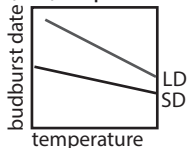Use temperature data to predict biological response.

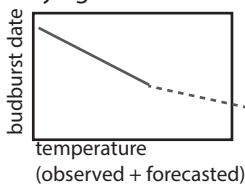Forecast future using temperature projections.

Erroneous predictions?

Alternative approach (with photoperiod)

Use temperature & daylength categorical data (L/S) to predict biological response

Forecast future using temperature projections & daylegth.

More accurate predictions?

Use temperature & daylength data to predict biological response