

SHINY GUIDE: PHENOLOGY

https://aeroecology.shinyapps.io/Birds_Bugs_and_Phenology/

This model uses theoretical data to demonstrate the impact of temperature change over time on the timing of caterpillar availability and birds' need for caterpillars as a resource. (Are enough caterpillars available to sustain a bird population during breeding season?)

Temperature Change over 10 years

This slider is used to set a temperature change between -1°C (colder) or 1°C (hotter) which occurs over a 10-year period.

Response to Temperature

Birds

- This slider is used to set how much temperature impacts bird behavior on a scale from weak effects (0) to strong effects (1).
- This could indicate, for example, whether birds migrate earlier or later based on temperature (strong), or if they always migrate at the same time of year regardless of temperature (weak).

Caterpillars

- This slider is used to set how much temperature impacts caterpillar emergence, on a scale from weak effects (0) to strong effects (1).
- This could indicate, for example, whether caterpillars hatch/emerge earlier or later based on temperature (strong), or if they always hatch/emerge at the same time of year regardless of temperature (weak).

Graphs

Interpreting the curves

- The y-axis measures both the availability of caterpillars and the required number of caterpillars to support the bird population during breeding season.
- The green curve represents the size of the caterpillar population available over time. The red curve represents the number of caterpillars needed by the birds over time.
- The shaded space under the curves indicates times when there are enough caterpillars to meet the needs of the bird population. The smaller the area of overlap, the greater the phenology mismatch.
- For the trio of curve graphs: The top graph shows the phenology match at the current temperature. The middle graph shows the phenology match after 30 years of

temperature change. The bottom graph shows the phenology match after 80 years of temperature change.

Interpreting the line graph

- This graph shows the population carrying capacity for birds over the period of 100 years, given the set temperature change and temperature sensitivity of caterpillars and birds. It gives an approximation of how temperature change affects the success of bird populations over time.