

Phenology is the study of the timing of seasonal changes in the biological world

- Species depend on timing to find food, reproduce and survive
- Biological events are often synchronized with the seasons

Arthropods are invertebrates with segmented bodies, jointed legs and exoskeletons

- Insects
- Spiders and mites
- Crustaceans
- They matter because they are vital to our ecosystem: pollinators, decomposers and prey for many species

Citizen science allows nonscientists to contribute to real research

- Beat sheet survey: shake branches to collect insects, like caterpillars
- Visual surveys: count insects on leaves or flowers

Shifts in phenology due to climate change can disrupt ecosystems and have a cascading effect on food webs

Learning objectives

- Explain how local adaptation may hinder a population's ability to survive under novel climate conditions
- Describe how energy moves through trophic levels in an ecosystem
- Identify changes that can be made by the general population to increase pollination of crops and promote healthier pollinator populations
- Provide examples of biomagnification
- Research the mechanisms whereby pathogens and pesticides affect pollinators.
- Define Colony Collapse Disorder and list its effects

Why care about butterflies and moths?

- They are a highly diverse group with over 250,000 species and make up around one quarter of all named species.
- Thought to have first evolved 150 million years ago and have been around for at least 50 million years
- Serve as a flagship species for conservation in general, and in particular for invertebrates.
- They are an indicator of a healthy ecosystem
- A very important element of the food chain

Biomagnification

- A process where toxins build up and become more concentrated as they move up the food chain, meaning organisms higher up in the food chain have more toxins than those lower down