

Phenology and Citizen Science

Biology 308



What is phenology?

“The study of the timing of the seasonal activity of plants and animals”



Why phenology?

Phenology is nature's calendar.

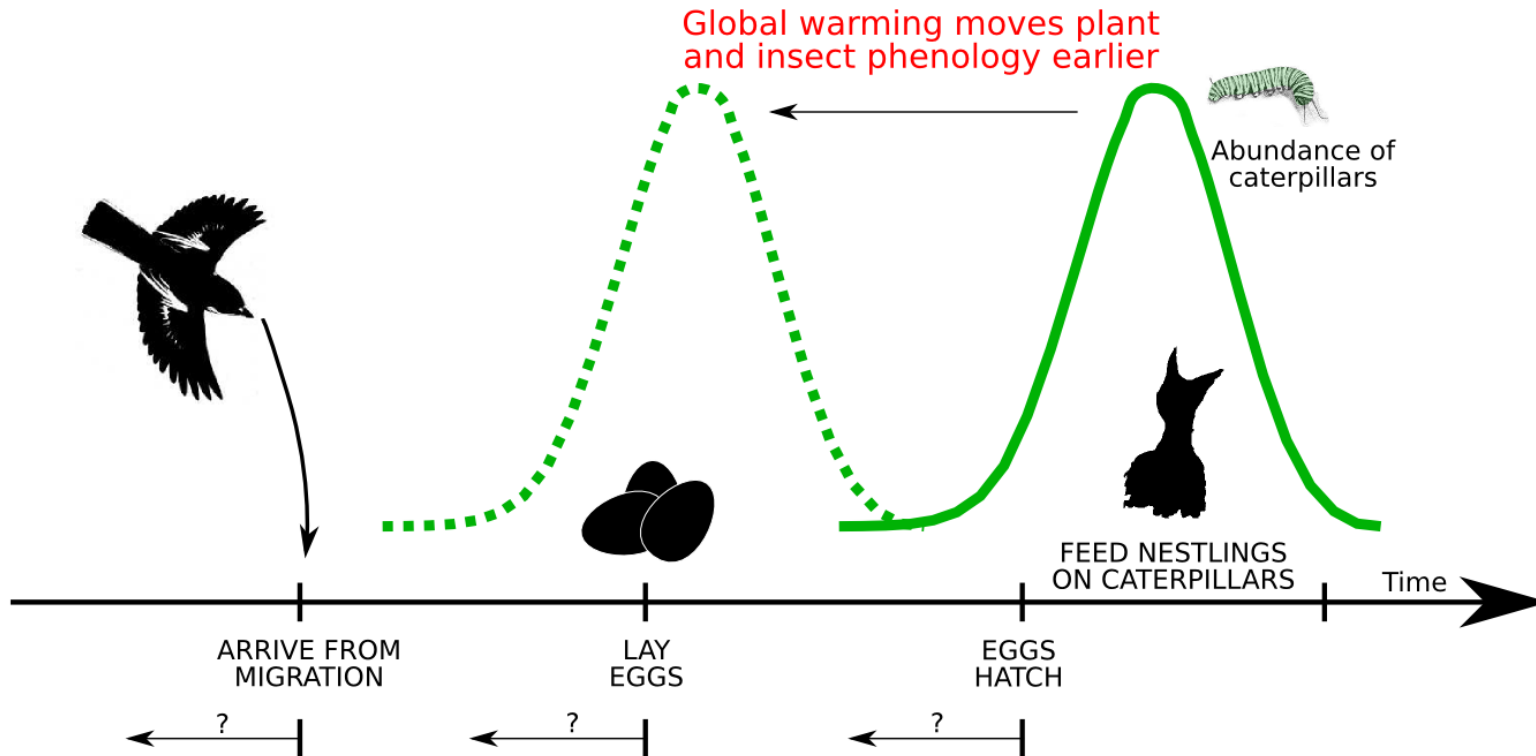


Why phenology?



Photos: Brian F Powell, Erin E Posthumus

Why phenology?



What will be the effect on migratory bird phenology?

Phenophases

“A distinct event in the annual life cycle of a plant or animal in relation to changes in seasons and climate.”

ANIMAL

Activity

Reproduction

Development

PLANT

Leaves

Flowers

Fruits

Who observes phenology?



Photos: Brian F Powell, Thoreau image from the National Portrait Gallery, Washington, Nina Leopold Bradley photo from Journal Sentinel files

How do we gather phenological data?



A **multi-taxa, national-scale** plant and animal
phenology observation program

What is citizen science?

Scientific research conducted, in whole or in part, by amateur or nonprofessional scientists

Also known as:

- crowd science
- crowd-sourced science
- civic monitoring
- volunteer monitoring
- networked science
- participatory monitoring/research



Photo: Brian F Powell

The value of citizen science

Volunteers contribute ~\$2.5B annually to biodiversity research



Theobald et al 2015, *Biological Conservation*

Today's Lab:

- Today we will be using the Nature's Notebook protocols to observe trees on campus at George Mason University.
- We will be observing both presence/absence data and intensity data for a variety of tree phenophases.

Key Research Question:

- Short term: How do the phenophase intensity and presence vary across two species of landscaped trees?
- Long term: How does the timing and intensity of phenophases vary from year-to-year in two landscaped species?

How to Identify Your Tree

Bark Type

‘Papery’
Bark



Type 1: Smooth
(American beech,
Fagus grandifolia)



Type 2: Lenticels
(yellow birch, *Betula
alleghaniensis*)



Type 3: Peeling strips
(paper birch, *Betula
papyrifera*)



Type 4: Vertical
cracks (northern red
oak, *Quercus rubra*)



Type 5: Scales
(black cherry,
Prunus serotina)



Type 6: Plates
(black birch, *Betula
lenta*)



Type 7: Vertical
strips (red maple,
Acer rubrum)



Type 8: Intersecting
ridges
(white ash, *Fraxinus
americana*)

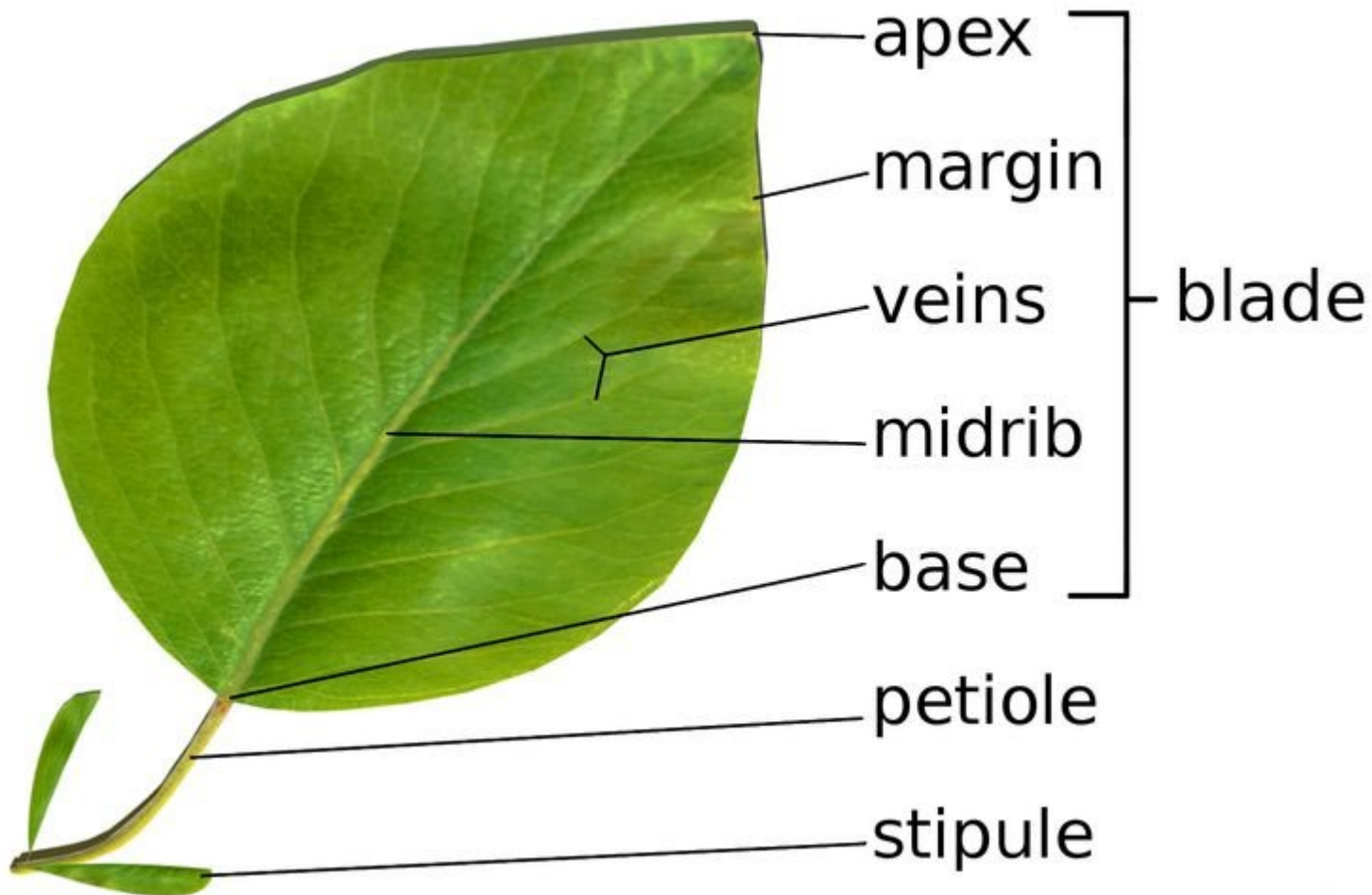


Type 9: Ridges
broken horizontally
(white oak, *Quercus
alba*)



Type 10:
Uninterrupted ridges
(northern red oak,
Quercus rubra)

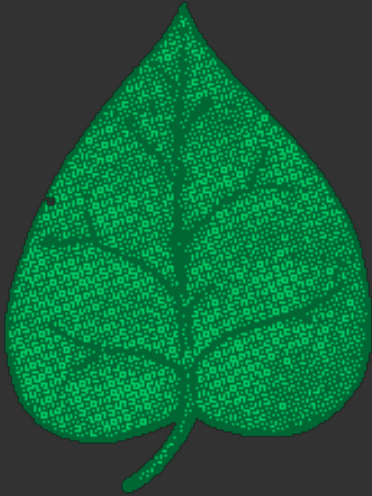
Leaf Anatomy



Leaf Type

Simple Leaf

Compound Leaves



**Pinnately
Compound**



**Twice
Pinnately
Compound**

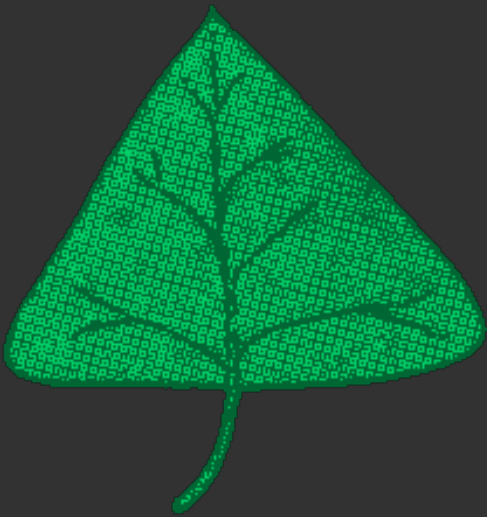


**Palmately
Compound**

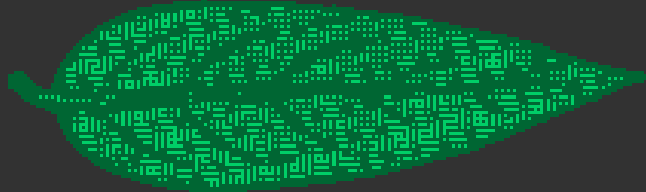
Leaf Shapes

Some examples include:

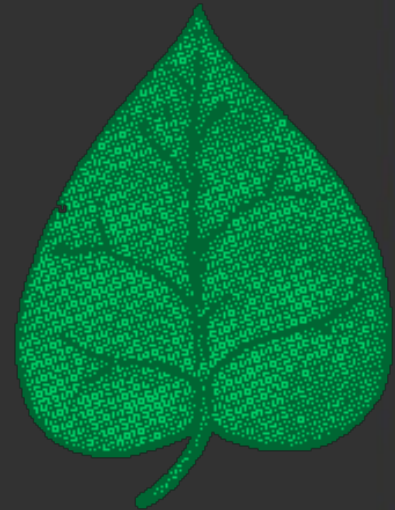
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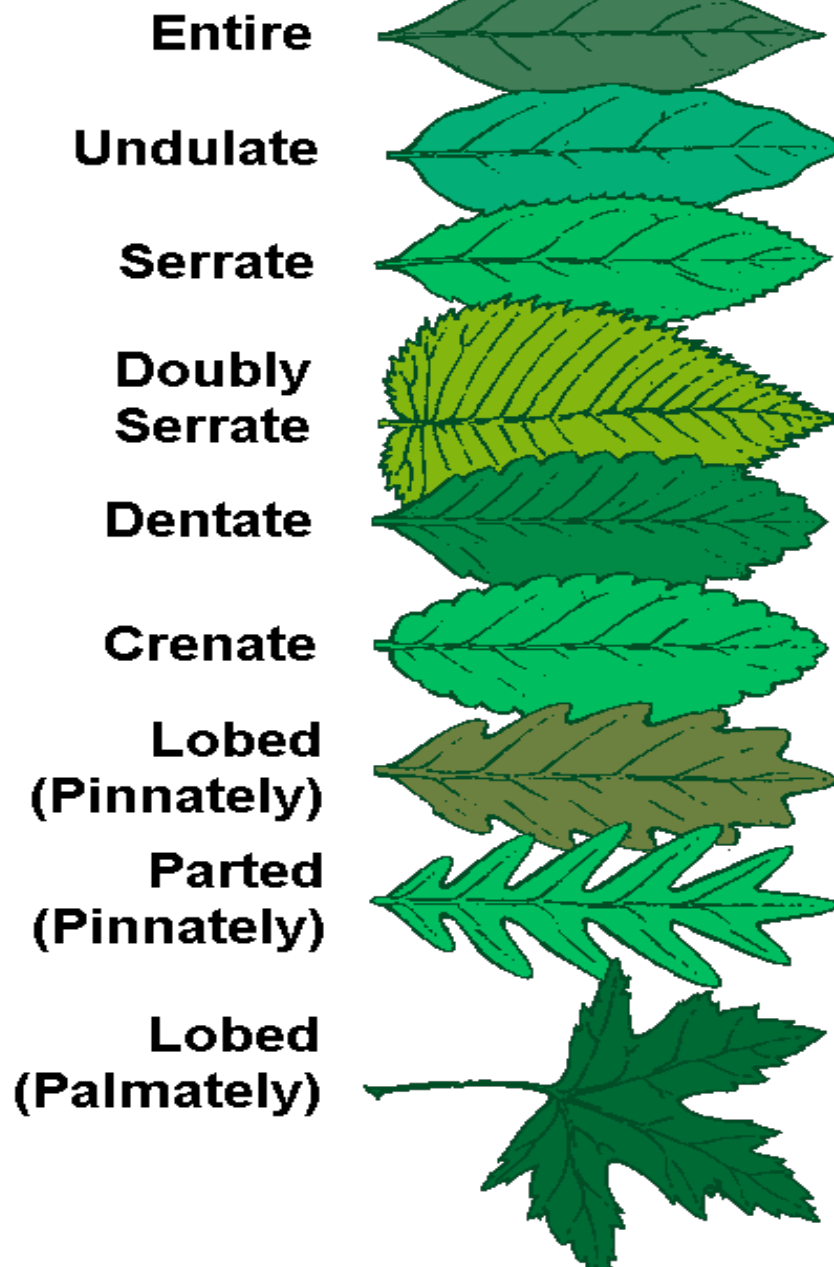
Lance-shaped



Heart-shaped



LEAF MARGINS



Leaf Position

- **Opposite** – Leaves and twigs grow directly apart from each other on branches
- **Alternate** – Leaves and twigs grow on branch in an alternating manner



Alternate or Opposite?



Alternate or Opposite?



Alternate or Opposite?



Alternate or Opposite?



Tree Fruits

Tree 'fruits' also include seeds and seed pods



ELM SEEDS:



Tree Flowers



Time to Observe!

