Mohonk Preserve Phenology Project

Foothills & Spring Farm Phenology Trails

Volunteer Orientation Spring 2016
Saturday, March 19th, 2016
9:00 AM – 1:00 PM

Celia Cuomo, Mohonk Preserve Phenology Project Volunteer Coordinator
Christy Belardo, Citizen Science Education Coordinator

Photo by Hallie Schwab
Phenology is Nature’s Calendar

Branch of Science Studying:

Timing of recurring seasonal stages in plant and animal life cycles

Phenology

Photo by Jay Diggs
Plant Bloom

Photo by Ken Pawson
Insect Emergence

Photo by Dave Johnson
Migration & Nest Building
Phenophase -- observable stage or phase in the annual life cycle of a plant or animal that can be defined by a start and end point.

Bud

Flower

Fruit or Seed

Trout Lily (aka Dogtooth Violet)

Egg Mass

Larvae

Wood Frog

Adult
What triggers the start and end of phenophases?

**Organisms respond to environmental cues**

*Photoperiod (Day Length)*

*Weather (Temperature & Precipitation)*
Photoperiod as a Phenophase Trigger: Same Every Year

[Graph showing Photoperiod vs. Calendar Date at 43.75 North Latitude]

http://www.dartmouth.edu/~mpayres/teaching/hhs/PhenologyStudy.pdf
On March 28th…

- High: 78°F in 1921
- Low: 0°F in 1923

120-year Average Temperature: 40.3°F

March Precipitation

- Low 1915: 0.28 inches
- 120-Year Average: 4.03 inches
- High 1896: 11.07 inches

Weather as a Phenophase Trigger: Highly Variable from Year to Year
The Timing Has To Be Right

To Avoid Unfavorable Climatic Conditions
- Plants that flower too early => risk frost damage

To Increase Availability of Food and Resources
- Insect-eating birds tend to migrate; while seed-eating birds may stay through the winter.

For Species Interacting
- Plants and Pollinators
- Predators and Prey
- Hosts and Pathogens
Timing Matters: Potential for mismatch or asynchrony in species interactions

Phenology and Climate Change
Research, spring timing and range A three-way mismatch

Which other species interactions might be at risk?

Both et al. 2006 Nature
Why Study Phenology?

Phenology... is perhaps the simplest process in which to track changes in the ecology of species in response to climate change.

--Intergovernmental Panel on Climate Change, 2007
Historic Phenology Records

Cherry Blossom - Reconstruct Spring Temperature Changes

Yasuyuki Aono and Keiko Kazui, 2007

Grape Harvest - Reconstruct Spring-Summer Temperatures

Chuine et al., 2004

Henry David Thoreau at Walden Pond

“On average, plants in Concord appear to flower now seven days earlier than they did when Thoreau made his observations (1852–1858).”

Abe Miller-Rushing and Richard Primack, 2008
Contributing to More than 120 Years of Natural History in the Shawangunks

Continuing a Long Legacy of Observational Data On the Gunks Land

Connecting Multiple Citizen Science Projects For the Bigger Picture

Climate Change Connections
Jefferson Salamander

23 days earlier

Hermit Thrush

6 days earlier

American Robin

New Year-round Residents of the Shawangunks

Wood Frog

14 days earlier

Black-throated Blue Warbler

5 days earlier

Turkey Vulture

Eastern Towhee

10 days earlier

Gypsy Moth Larvae

11 days earlier

Song Sparrow

Dave Johnson

Michael L. Baird

USFWS

USDA FS

USGS

USGS
We are part of the big picture!

<table>
<thead>
<tr>
<th>Observer Groups</th>
<th>Observations in 2015 (not to scale)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Phenology Network (NPN)</td>
<td>1,784,000 +</td>
</tr>
<tr>
<td>New York Phenology Network (NYPP)</td>
<td>180,000+</td>
</tr>
<tr>
<td>Phenology Observers at Mohonk Preserve</td>
<td>30,000+</td>
</tr>
<tr>
<td>Individuals (you!)</td>
<td></td>
</tr>
</tbody>
</table>
The New York Phenology Project is a networked community science initiative focused on climate and urbanization impacts on plants and pollinators.

The data is connected to both a national and regional database through the USA-National Phenology Network and is used by scientists, land managers and individuals to inform decision-making and build long-term data sets capable of answering pressing ecological questions. Learn more about phenology...

JOIN THE NETWORK!

www.nyphenologyproject.org for great resources, including species profiles!
Member Organizations with Active Monitoring Sites

**Central and Northern New York**
Finger Lakes Land Trust, Ithaca, NY
Huyck Preserve, Rensselaerville, NY
Intervale Lowlands Preserve, Lake Placid, NY
Lime Hollow Nature Center, Cortland, NY
Parkside Drive Park, Lake Placid, NY

**Mid and Lower Hudson Valley**
Cary Institute of Ecosystem Studies, Millbrook, NY
Community Greenways Collaborative, Bearsville, NY
Mianus River Gorge, Bedford, NY
**Mohonk Preserve, Gardiner, NY**
New Paltz High School, New Paltz, NY
New York Botanical Garden, Bronx, NY
Rye Nature Center, Rye, NY
Teatown Lake Reservation, Ossining, NY
Vassar College, Poughkeepsie, NY
Ward Pound Ridge, Pound Ridge, NY
KTD Monastery, Woodstock, NY*
Zen Mountain Monastery, Mt. Tremper, NY*

**New York City**
Gateway National Recreation Area (Jamaica Bay Wildlife Refuge), Queens, NY
New York Botanical Garden, Bronx, NY

**Long Island**
Gateway National Recreation Area (Jamaica Bay Wildlife Refuge), Queens, NY
South Fork Natural History Museum, Bridgehampton, NY
Third House Nature Center, Montauk, NY
Avalon Park and Preserve, Stony Brook, NY*
Greentree Foundation, Manhasset, NY*
Mashomack Preserve, Shelter Island, NY*
Ross School, East Hampton, NY*
Seatuck Environmental Association, Islip, NY*

*Member Organizations with Sites Under Development
"a national, online program where amateur and professional naturalists record observations of plants and animals to generate long-term data sets used for scientific discovery and decision-making."
Register for Nature’s Notebook and join a national community of observers

- Enter and Download Data
- Track your progress
- Access observation tips and resources
- Learn about how your data is used and what it’s telling us

Observation Deck

Enter your observations below or via smartphone. You can edit the sites, plants or animals you’ve selected anytime.

Sites
Mohonk Preserve
Mohonk Preserve Foothills Phen

My Plants & Animals
sugar maple-1
sugar maple-2
sugar maple-3
flowering dogwood-1
flowering dogwood-2
highbush blueberry-1
highbush blueberry-2
highbush blueberry-3
common winterberry -1
common winterberry -2
common winterberry -3

Details for this Organism
sugar maple-1
sugar maple (Acer saccharum)
Patch? Unknown
Wild? Yes
Gender? Female

Enter Observations

https://www.usanpn.org/natures_notebook
How did the Onset of Open Flowers in Red Maple Vary Across the Hudson Valley in 2014?

Hallie Schwab
Our Continuing Species

Jack in the Pulpit fruits (ripe and unripe)

Common Milkweed *
Common Winterberry
Eastern Redcedar *
Flowering Dogwood
Highbush Blueberry
Jack in the Pulpit *
New England Aster
Red Maple
Sugar Maple *
Trout Lily
Monarch Butterfly

* at both Foothills and Spring Farm
New Plant Species (at Spring Farm)

Witch Hazel

Northern Red Oak

Christy Belardo

Bruce Kirchhoff
More New Species (at Spring Farm)

Northern Spicebush  
Tom Potterfield

White Wood Aster  
Sara Rall
More New Species – Herps (at Foothills)

Wood Frog

Spring Peeper
ANIMAL: Monarch Butterfly

Activity
- Active individuals
- Flower Visitation
- Migrating Adults

Reproduction
- Mating

Development
- Young individuals
- Dead individuals

PLANT: Red Maple

Leaves
- Breaking Leaf Buds
- Leaves
- Colored leaves

Flowers
- Flowers or flower buds
- Open flowers

Fruits
- Ripe fruits
- Recent seed or fruit drop
DECIDUOUS PLANT PHENOPHASES

Breaking Leaves

Increasing Leaf Size

Leaves

Colored Leaves

Flowers or Flower Buds

Open Flowers

Fruits

Ripe Fruits

Recent Fruit or Seed Drop

Nested Phenophase: a phenophase that always occurs at the same time that an umbrella phenophase is occurring.
Data Collection Basics

What do volunteers do?
Make and record repeated observations of plants and animal phenophases.

How Often?
As often as you’d like! Observe when you can, and don’t worry when you can’t—it’s a group site! Once a week will allow you to see a wide range of phenophases.

What do I need?
Pencil, datasheet (or Nature’s Notebook smartphone App), printed phenophase definitions. Optional: binoculars, hand-lens, clip board, camera
Look for all phenophases each time you observe

Highbush Blueberry

Do you see
Breaking Leaf Buds?
Flower Buds?

☐ Yes
☐ No

If you’re not sure, use your ? option, then use your resources:
• Phenology Leaders – Celia, Carol, Christy
• Fellow Volunteers
• Species ID Guides
• National Phenology Network Protocols
• Botany Guides and Websites
Continue to mark **Yes** for entire duration of the phenophase

<table>
<thead>
<tr>
<th></th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Red Maple Leaves</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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Keep looking even after you think the phenophase has ended.

Photos: Hallie Schwab
“Negative Data” provides supporting evidence for our observations.

When are phenophases NOT occurring?

Red Maple: Open Flowers?

- March 26
  - NO

- April 2
  - YES

- April 9
  - YES

(2014 dates)

Photos: Hallie Schwab
Botany Term: *Petiole*

**petiole** = stalk that attaches leaf to stem or branch

In our protocols, a *breaking leaf bud* becomes a *leaf* only once the petiole is visible.
Breaking Leaf Buds or Leaves?

- **Closed Leaf Bud**

  - **Leaves**
  - **Breaking leaf buds**
  - **Increasing leaf size**
  - **Colored leaves**
  - **Falling leaves**

  Photos: Hallie Schwab except where indicated

  E.G. Denny

Leaves

Petiole (stem) visible

E.G. Denny
Red Maple

<table>
<thead>
<tr>
<th>Flowers or flower buds</th>
<th>y n ?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open flowers</td>
<td>y n ?</td>
</tr>
<tr>
<td>Pollen release</td>
<td>y n ?</td>
</tr>
</tbody>
</table>

Flower Buds & One Open Flower

Celia Cuomo

Hallie Schwab
<table>
<thead>
<tr>
<th>Flowers or flower buds</th>
<th>y</th>
<th>n</th>
<th>?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open flowers</td>
<td>y</td>
<td>n</td>
<td>?</td>
</tr>
<tr>
<td>Pollen release</td>
<td>y</td>
<td>n</td>
<td>?</td>
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Red Maple, Hallie Schwab

Sugar Maple
Joseph Berger, Bugwood.org
Flower Buds or Open Flowers?

Trout Lily

Flower Buds

Open Flowers

*Must See Reproductive Parts to be Open Flower
Pop Quiz

What phenophases do you see?

Leaves

Flowers or Flower Buds
- Open Flowers
- Leaves

E.G. Denny

Hallie Schwab
Botany Term: **Bract**

**bract** = a modified leaf, often beneath or surrounding the flower (sometimes confused with petals)

Flowering Dogwood

Bracts
Leaf Buds or Flower Buds?

Red Maple
Hallie Schwab

Flower Buds

Leaf Buds

Highbush Blueberry
Hallie Schwab

Flowering Dogwood
Maurice Weitman

Immature Bracts
The Special Case of the Flowering Dogwoods: Flowers

- Bracts (open)
- Flower Buds, closed (inside bracts)

- Bracts (open)
- Open Flowers & Buds
The Special Case of a Conifer: Eastern Redcedar

Male Cones

Female Cones

Celia Cuomo

Hallie Schwab
Pop Quiz
What phenophases do you see?

Red Maple
- Flowers or Flower Buds
- Open Flowers
- Breaking Leaf Bud

Highbush Blueberry
- Flowers or Flower Buds
- Open Flowers
- Leaves

Hallie Schwab
# Monarch Butterfly Phenophases

<table>
<thead>
<tr>
<th>Do you see/hear...</th>
<th>Date:</th>
<th>Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active adults</td>
<td>y</td>
<td>n</td>
</tr>
<tr>
<td>Flower visitation</td>
<td>y</td>
<td>n</td>
</tr>
<tr>
<td>Migrating adults</td>
<td>y</td>
<td>n</td>
</tr>
<tr>
<td>Mating</td>
<td>y</td>
<td>n</td>
</tr>
<tr>
<td>Active caterpillars</td>
<td>y</td>
<td>n</td>
</tr>
<tr>
<td>Caterpillars feeding</td>
<td>y</td>
<td>n</td>
</tr>
<tr>
<td>Dead adults</td>
<td>y</td>
<td>n</td>
</tr>
<tr>
<td>Dead caterpillars</td>
<td>y</td>
<td>n</td>
</tr>
<tr>
<td>Individuals at a feeding station</td>
<td>y</td>
<td>n</td>
</tr>
<tr>
<td>Individuals in a net</td>
<td>y</td>
<td>n</td>
</tr>
</tbody>
</table>

Comments:

Check when data entered online: ☐
How can you make your data more accurate?

☐ YES  ☐ NO

☐ ?

Don’t guess!

Use “?” when in doubt (you can change it later)
Where to Get Help & Learn More

- Informal field sessions & workshops
  - Collaboration
  - Group Effort & Discussion
- Phenophase Definitions
  - (National Phenology Network)
- Species ID Guides
  - (New York Phenology Project)
- Phone a Friend
- Ask staff & other volunteers
  - Photos are helpful when e-mailing questions
- Facebook Group – Private Forum
  - “Mohonk Preserve Phenology Project Volunteers”
Our Phenology Community

Make friends . Exchange Contact Info

Welcome New Volunteers . Have fun!
Upcoming Pheno Dates

- Tuesday, March 29 – 9:30am – 11:30am
  - Informal Field Session at Foothills
- Tuesday, April 19 – 7:00pm – 9:00pm
  - Tricky Phenophase Workshop at VC Conference Room
- Friday, May 13 – 9:30am – 11:30am
  - Informal Field Session at Spring Farm
- Tuesday, June 21 – 5:30pm – 7:30pm
  - Phenology Volunteer Picnic at Slingerland Pavillion
Contact

Christy Belardo
Citizen Science Education Coordinator

cbelardo@mohonkpreserve.org
845.255.0919 ext. 1235 (Visitor Center)
Ext. 1271 (Daniel Smiley Research Center)
845.419.1595 (Cell Phone)
Thank You

Mohonk Preserve Phenology Project Volunteer Observers, Mohonk Preserve Staff, Daniel Smiley Research Center, the Mohonk Preserve Volunteer Photographers, Celia Cuomo National Phenology Network, New York Phenology Project