Learning about Forests (LEAF) Monthly Planning Guide for LINKS Chapters

March 2024

Overview

Monthly Theme	Environmental Awareness Days	Cultural and Identity Awareness Days
Community Science: Trees and Ecosystems Through the Seasons	Youth Art Month | World Wildlife Day (3) | International Day of Forests (21) | World Water Day (22)	Women's History Month | Gender Equality Month | Crispus Attucks Day (5) | Harriet Tubman Day (10)

Elementary	1. Activity 1: Birthday Phenology Game 2. Activity 2: Phenology Observation Scavenger Hunt and Blitz
Middle and High School	1. Activity 1: Phenology Bingo Game 2. Activity 2: Phenology Observation Scavenger Hunt and Blitz

Mentoring Moment Suggestion

Seek out passionate volunteers, activists, elders, and Indigenous members of the community, consider accessing the expertise of dendrologists, arborists, natural resource managers, biologists, entomologists, naturalists, botanists, farmers, gardeners, or environmental educators.

Community Science: Trees and Ecosystems Through the Seasons

ELEMENTARY ACTIVITIES

SUMMARY

These activities will provide youth with an opportunity observe trees during spring. They will also be introduced to the study of phenology and understand how seasonal changes in plants affects ecosystems, wildlife, and humans.

MATERIALS

- Birthday Phenology Game *(attached)*
- Phenophase Spring Scavenger Hunt *(also attached)*

Plant Observation Sheets:

- Broadleaf Evergreens Observation Sheet
- Conifers Observation Sheet
- Deciduous Trees and Shrubs Observation Sheet
- Grasses Observation Sheet
- Wildflowers and Herbs Observation Sheet

BACKGROUND[1]

Phenology is the study of the timing and cyclical patterns of events in the natural world, particularly those related to the annual life cycles of plants, animals, and other living things. These events include the budding of leaves in spring, the arrival of migratory birds, the flowering of plants, and the onset of fruit ripening. Phenology is a vital field of ecological research that helps us understand how living organisms respond to environmental cues such as day length, temperature, and rainfall, and how climate change can impact these seasonal changes.

Most modern data collection methods, including the USA-NPN's *Nature's Notebook* program, take a Western science approach to phenology. However, indigenous cultures have long held a deep connection with phenology. For many indigenous communities around the world, the observations of natural cycles and the traditional ecological knowledge passed down through generations play a central role in their way of life. Phenology informs crucial decisions in these cultures, including when to plant and harvest crops, when to conduct rituals or ceremonies, and when to expect the arrival of specific animals for hunting or gathering. Indigenous peoples' understanding of phenology is often deeply intertwined with

[1] https://www.usanpn.org/about/phenology#:~:text=Phenology%20Info%20Sheets

their spiritual beliefs and is a testament to their profound respect for the environment and the intricate relationships between humans and the natural world.

Studying phenology is of paramount importance in today's world, as it offers a window into the impacts of climate change and the consequences for ecosystems and human societies. By monitoring phenological shifts, scientists can gain valuable insights into how global warming is altering the timing of key biological events. These shifts can have cascading effects on ecosystems, disrupting the delicate balance between species and affecting agricultural practices and food security. Moreover, the study of phenology can aid in the development of more effective conservation strategies, enabling us to better anticipate and mitigate the challenges posed by changing environmental conditions. In short, phenology provides essential data for understanding, adapting to, and mitigating the ecological and societal consequences of a changing climate.

Activity 1: Birthday Phenology Game

Students will gain awareness of local phenology and each other by playing a game connecting their birthdays with local phenology and seasonal phenomenon.

WHAT TO DO [full lesson plan attached]

1. Begin the activity with the following questions.
    a. What have you noticed about how plants and animals change from season to season?
    b. What are some things you have noticed about the plants and animals in each season? Spring, summer, autumn, and winter?
    c. What are ways that we change our behaviors as the seasons change?

2. Depending on what works best for the group, either give each student a personal phenology wheel, or post a large on in front of the class for everyone to see.
3. Use the wheel to connect students' birthdays to seasonal phenomena and cycles.

Activity 2: Phenology Observation Scavenger Hunt and Blitz

These data collection activities will allow students to observe and understand seasonal changes in trees, grasses, and wildflowers.

WHAT TO DO

1. Plan an outing to a park or local greenspace where youth will be able to make observations of a variety of plants, including broadleaf evergreens, conifers, deciduous trees, grasses, wildflowers, and herbs.

2. Discuss how phenology and climate are linked.[2]

> *How plants react to seasonal change has a big impact on the environment. Because plants are at the base of the food chain, anything that affects plants can impact other parts of the ecosystem. Phenology is important because it affects plants ability to produce fruits and seeds and food availability for other animals like birds and squirrels. It is important to humans because our food supply depends on plants. blooming when pollinators are available. And, to scientists, changes in the timing of phenological events can be used as indicators of changing climates. [Budburst.org]*

3. To help students begin to make plant observations in the environment, pass out the spring scavenger hunt below. Model how to make plant observations by looking for one of the items on the scavenger hunt. Students can work in groups to complete their observations.

- Phenophase Spring Scavenger Hunt *(also attached)*

4. Use the worksheets below *(also attached)* to record student observations of different types of plants, trying to capture as many different phenological stages as you can find.

- Broadleaf Evergreens Observation Sheet
- Conifers Observation Sheet
- Deciduous Trees and Shrubs Observation Sheet
- Grasses Observation Sheet
- Wildflowers and Herbs Observation Sheet

5. Reflect on student observations.

- What did you notice? What questions do you have?
- Reflect on the lifecycle of plants. What happens after a plant produces flowers?
- How will these plants change during other seasons? Reflect What will happen to the leaves of deciduous trees during fall?

[2] https://budburst.org/phenology-and-climate

Community Science: Trees and Ecosystems Through the Seasons

MIDDLE AND HIGH SCHOOL ACTIVITIES

SUMMARY

These activities will provide youth with an opportunity observe trees during spring. They will also be introduced to the study of phenology and understand how seasonal changes in plants affects ecosystems, wildlife, and humans.

MATERIALS

- Phenology Bingo Lesson Plan *(attached)*
- Phenophase Spring Scavenger Hunt *(also attached)*

Plant Observation Sheets:

- Broadleaf Evergreens Observation Sheet
- Conifers Observation Sheet
- Deciduous Trees and Shrubs Observation Sheet
- Grasses Observation Sheet
- Wildflowers and Herbs Observation Sheet

BACKGROUND[3]

Phenology is the study of the timing and cyclical patterns of events in the natural world, particularly those related to the annual life cycles of plants, animals, and other living things. These events include the budding of leaves in spring, the arrival of migratory birds, the flowering of plants, and the onset of fruit ripening. Phenology is a vital field of ecological research that helps us understand how living organisms respond to environmental cues such as day length, temperature, and rainfall, and how climate change can impact these seasonal changes.

Most modern data collection methods, including the USA-NPN's *Nature's Notebook* program, take a Western science approach to phenology. However, indigenous cultures have long held a deep connection with phenology. For many indigenous communities around the world, the observations of natural cycles and the traditional ecological knowledge passed down through generations play a central role in their way of life. Phenology informs crucial decisions in these cultures, including when to plant and harvest crops, when to conduct rituals or ceremonies, and when to expect the arrival of specific animals for hunting or gathering. Indigenous peoples' understanding of phenology is often deeply intertwined with their spiritual beliefs and is a testament to their profound respect for the environment and the intricate relationships between humans and the natural world.

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Activity 1: Phenology Bingo [full lesson plan and bingo template attached]

WHAT TO DO

1. Using the included bingo card as a template, make enough copies for everyone. The second side is blank so participants can create their own seasonal events or modify the regional events that are listed. For example, instead of the event—"Seen a desert tortoise"—change it to a more regionally appropriate wildlife species like, "seen an American Robin", etc.

2. Instruct the students to circulate the room and find someone who has experienced one of the events on the sheet. When they find someone, ask them to initial it.

3.The card is a conversation starter; the participants should circulate the room to find someone who has experienced one of every item on the bingo card.

4. As soon as a participant has found someone for each event, they are done.

Activity 2: Phenology Observation Scavenger Hunt and Blitz

These data collection activities will allow students to observe and understand seasonal changes in trees, grasses, and wildflowers.

WHAT TO DO

1. Plan an outing to a park or local greenspace where youth will be able to make observations of a variety of plants, including broadleaf evergreens, conifers, deciduous trees, grasses, wildflowers, and herbs.

2. Discuss how phenology and climate are linked.[4]

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3. To help students begin to make plant observations in the environment, pass out the spring scavenger hunt below. Model how to make plant observations by looking for one of the items on the scavenger hunt. Students can work in groups to complete their observations.

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5. Reflect on student observations.

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- Reflect on the lifecycle of plants. What happens after a plant produces flowers?
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[4] https://budburst.org/phenology-and-climate

nature's notebook
A project of the USA-NPN

Birthday Phenology Game

Photo Credit: Eyesplash

Grade Levels
3-5

Overview
Students will gain awareness of local phenology and each other by playing a game connecting their birthdays with local phenology and seasonal phenomenon.

Background
Phenology is the study of the timing of life cycle events, done mostly through personal observations.

Real-world Connection
Local phenologies differ! The new student from another county or state may hold a different set of phenology facts in mind! This need not be a problem; it can spark a good discussion about why phenologies will vary from place to place. For example, latitude, altitude, and/or nearness to large temperature-moderating bodies of water can all affect local phenology.

Citizen Science Connection
This activity can be completed without a *Nature's Notebook* account. However, the visualization tool can be used to examine phenology data, and exemplify the value of citizen science.

Estimated Time
20-30 minutes

Learning Objectives

Participants will be able to:

- Be aware of local phenology and seasonal phenomena
- Understand the importance of phenology to our understanding of our place
- Learn something about each other
- Be curious about local phenology
- Be inspired to become observant when outdoors

Next Generation Science Standards

LS: Life Sciences			
	Grade 3		Grade 5
3-LS1-1	Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death	5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Conducting the Activity

Materials

Resources needed

- 11" individual phenology wheel templates or one 32" classroom template
- Writing Materials
- Colored adhesive notepads (optional)
- Magazines, scissors, and glue sticks for a collage (optional)

Engage

Connect to prior knowledge

- Ask students about ways they have noticed that plants and animals change from season to season.
- What are some things that they have noticed about the plants and animals in every season? Spring, summer, autumn, and winter.
- What are ways that we change our behaviors as the seasons change?

RESOURCES
Adapted from:

Birthday Phenology Game: A Getting-to-Know-You Game

By: Georgia Gómez-Ibáñez, Cambridge Elementary School, WI

NOTES ON ACTIVITY

Conducting the Activity

Explore

Hands-on learning

1. Depending on what works best for your classroom, either give each student a perosnal phenology wheel, or post a large on in front of the class for everyone to see. An example wheel is attached to this lesson plan.
2. The teacher should be the first player, so that the students understand how to play this game. For example the teacher says: "My birthday happens when the white flowers are blooming on the wild black raspberries; in what month is my birthday?" And the guessing begins, with each student in turn.
3. You may want to divide students into groups according to season and let them brainstorm together. This often sparks conversations about the natural world that involve students who may not normally interact and takes the pressure off those who are having difficulty coming up with something.
4. Put the birthdays (and phenology facts) on the phenology wheel inside their corresponding month. Post-it notes that are color-coded can be used as a temporary way to put information up on the wheel, to be written in and embellished later.
5. In the middle of the wheel, draw a picture or make a collage representing either a unifying theme of what everyone contributed to the wheel.

Explain

Listening and communicating understanding

- Do some of the phenology facts intersect in interesting ways?
- Do some phenology facts depend on each other?
- What other phenology facts might the class want to learn, inspired by the birthday phenology facts?

Extend

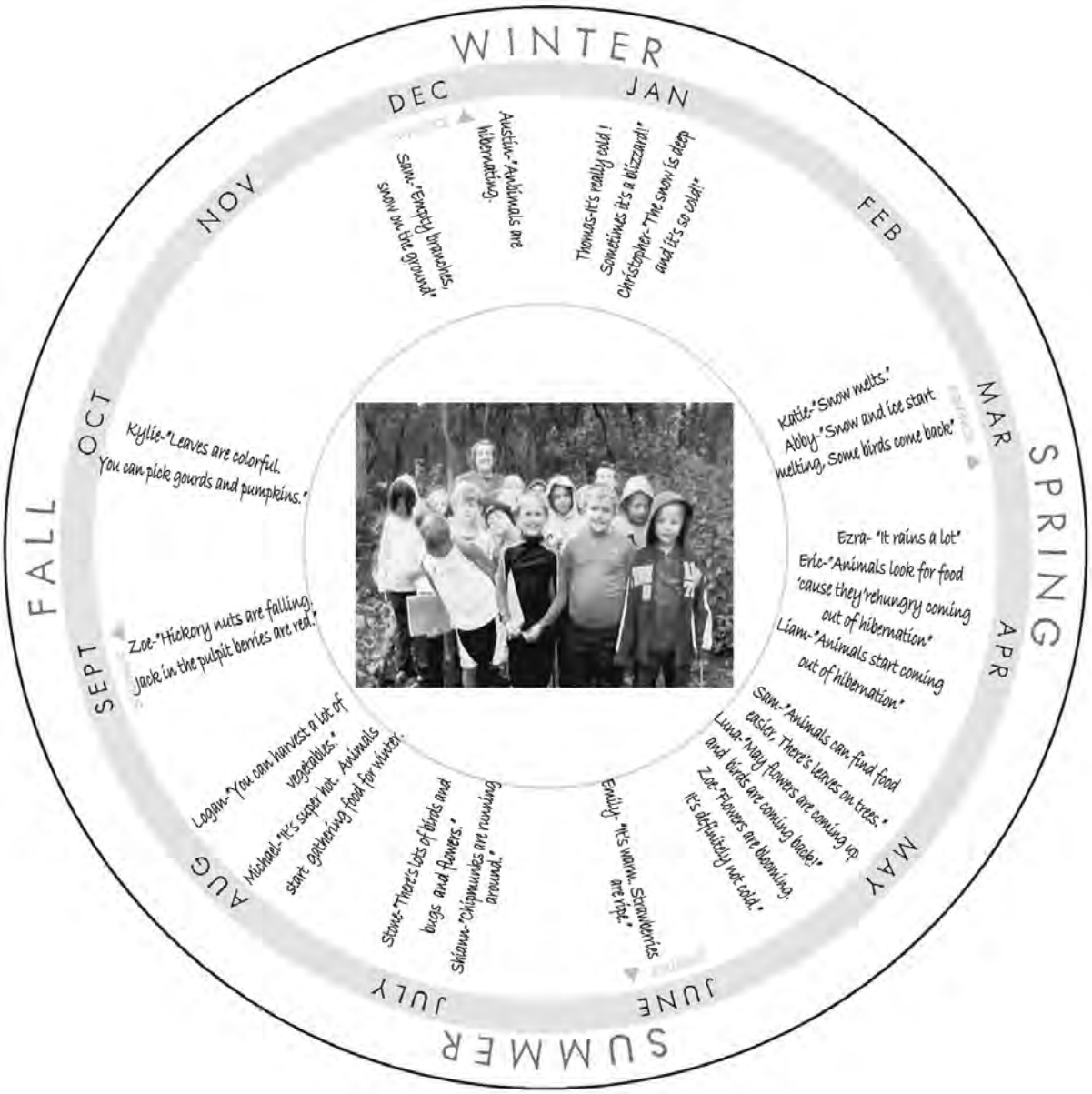
Group projects, real world connections

1. For older students, access Web sites to do research, such as USA-National Phenology Network (http://www.usanpn.org) Project Budburst (http://www.budburst.org), Journey North (http://www.jour-naynorth.org), and Earth Alive! (http://www.naturenet.com/EarthAlive). A team building activity could include asking each student to find a phenology fact for a classmate's birthday.
2. The USA-NPN visualization tool can be used to show students how long certain phenological events occur throughout the year.

Evaluate

Summarize, check for understanding, assess

- Demonstrate an understanding of phenology as a study of natural events and cycles in a place that relate to seasonal and climate changes.
- Demonstrate an understanding of phenology in place by drawing a four-panel colored picture of a place in each season.
- Show an understanding of local phenology using your birthday month observations.



An example of a birthday phenology classroom wheel

budburst
A project of the Chicago Botanic Garden

Find that Phenophase!

Look for…	Example	Draw/describe what you saw
1. A conifer with new needles emerging		
2. A leaf or flower bud bursting		
3. A new leaf growing/unfolding		
4. A deciduous tree with no new leaves		
5. A plant with one or a few fully open flowers		
6. A plant with many fully open flowers		
7. What else did you see?		

Images: ian.umces.edu/media-library; pixabay.com

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A project of the Chicago Botanic Garden

PHENOLOGY OBSERVATIONS
BROADLEAF EVERGREENS

When did you observe?

Date

Which plant did you observe?

Common Name or Scientific Name

Plant Nickname e.g. Backyard Lily. This helps you make another observation on this plant in the future.

Where did you make your observation?
Provide address **OR** latitude/longitude.

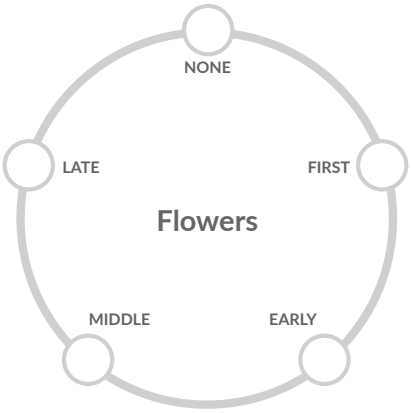
Address

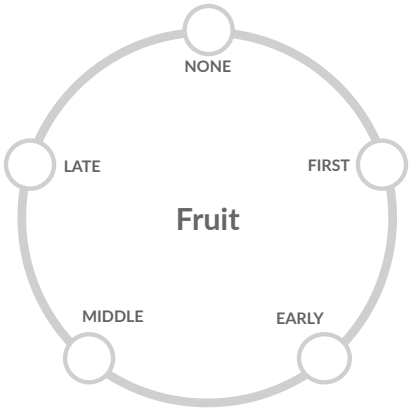
City, State/Province, Postal code

Latitude

Longitude

What is your plant doing? Check the most applicable option for **each** category below.





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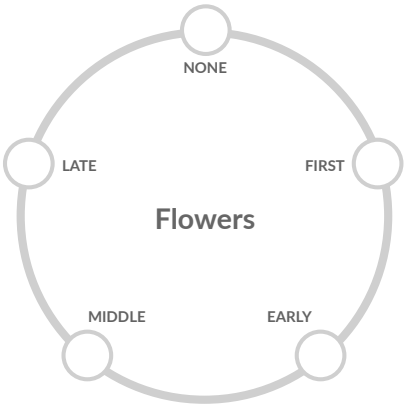
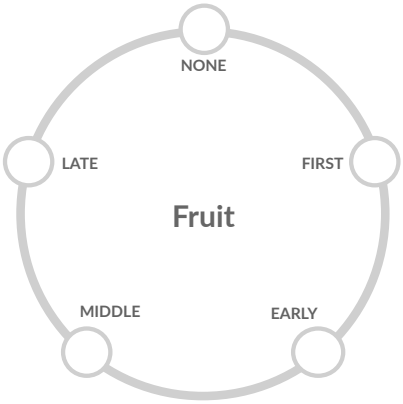
PHENOPHASE DEFINITIONS
BROADLEAF EVERGREENS



Flowers

None - No flowers visible.
First - First flowers are fully open (stamens/pistils are visible) on at least three branches. When open, flowers on wind-pollinated plants will release yellow dust-like pollen when touched.
Early - Only a few flowers have emerged (less than 5%).
Middle - Half or more of the flowers are fully open or releasing pollen on three or more branches.
Late - Most flowers have wilted or fallen off (over 95%).



Fruit

None - No ripe fruits visible.
First - First fruits becoming fully ripe or seeds dropping naturally from the plant on three or more branches. Ripening is usually indicated by a change in color to the mature color, or by drying and splitting open (for dry fruits such as capsules).
Early - Only a few ripe fruits are visible (less than 5%).
Middle - Half or more of the fruits are completely ripe or seeds are dropping naturally from the plant.
Late - Most fruits or seeds have been dispersed from the plant (over 95%).

budburst
A project of the Chicago Botanic Garden

PHENOLOGY OBSERVATIONS
CONIFERS

When did you observe?

Date

Which plant did you observe?

Common Name or Scientific Name

Plant Nickname e.g. Backyard Lily. This helps you make another observation on this plant in the future.

Where did you make your observation?
Provide address **OR** latitude/longitude.

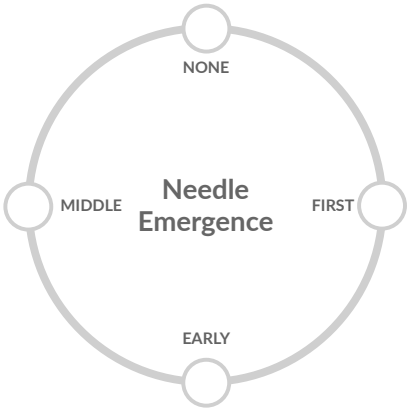
Address

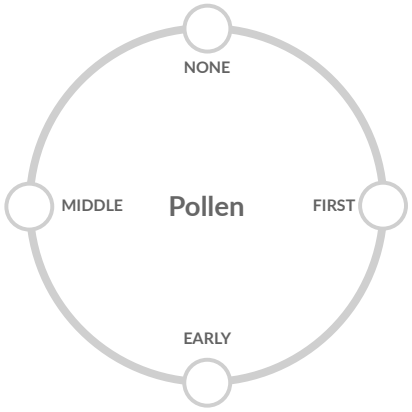
City, State/Province, Postal code

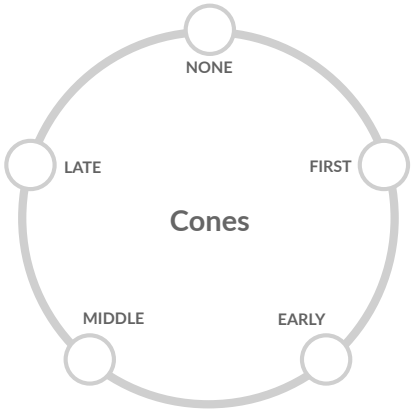
Latitude

Longitude

What is your plant doing? Check the most applicable option for **each** category below.







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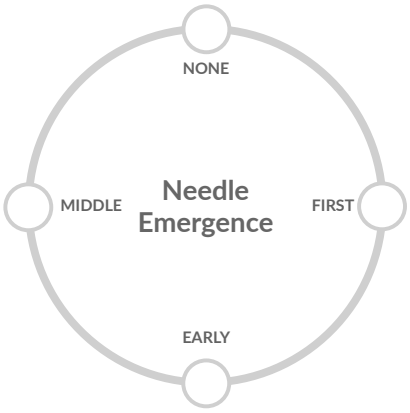
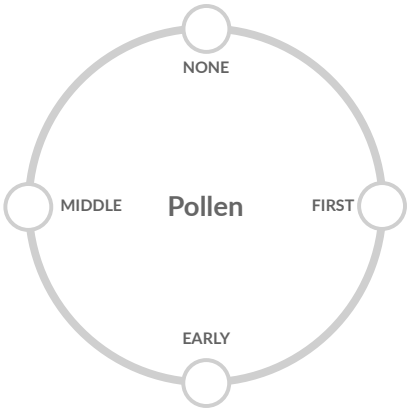
PHENOPHASE DEFINITIONS
CONIFERS



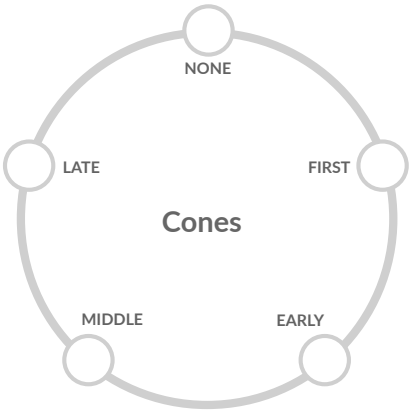
Needle Emergence

None - No new needles are emerging.
First - New needles emerge from tips of buds or are visible from the side of the buds on three or more branches.
Early - A few new needles have emerged (less than 5%).
Middle - Many new needles have emerged.



Pollen

None - No pollen is falling.
First - Plant starts releasing the powdery yellow pollen from cones on three or more branches (from male cones which are usually small and rounded). When open, the male cones will release yellow pollen dust when touched.
Early - Some pollen is falling (less than 5%).
Middle - Half or more branches have pollen. When open, the male cones will release yellow pollen dust when touched.



Cones

None - No ripe cones or seeds visible.
First - First seed cones becoming fully ripe or seeds dropping naturally from the plant on three or more branches. Record when the seed cones turn brown and the scales expand (seeds should start dispersing shortly thereafter).
Early - Only a few branches have fully ripe cones or seeds dropping naturally from the tree (less than 5%).
Middle - Half or more branches have fully ripe cones or most of the seeds are dropping naturally from the tree.
Late - Most cones are open and seeds have been dispersed from plant (over 95%).

budburst
A project of the Chicago Botanic Garden

PHENOLOGY OBSERVATIONS
DECIDUOUS TREES AND SHRUBS

When did you observe?

Date

Which plant did you observe?

Common Name or Scientific Name

Plant Nickname e.g. Backyard Lily. This helps you make another observation on this plant in the future.

Where did you make your observation?
Provide address **OR** latitude/longitude.

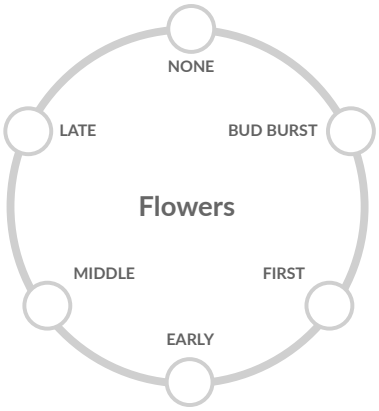
Address

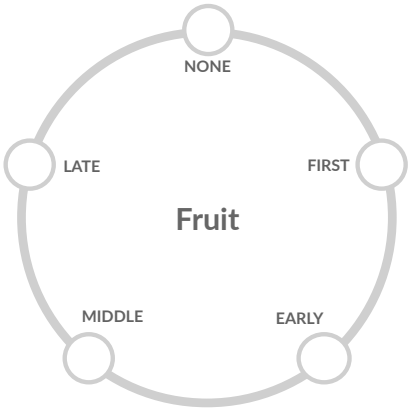
City, State/Province, Postal code

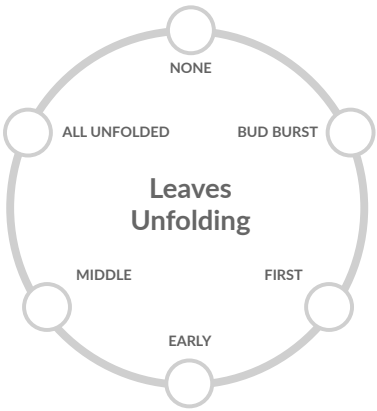
Latitude

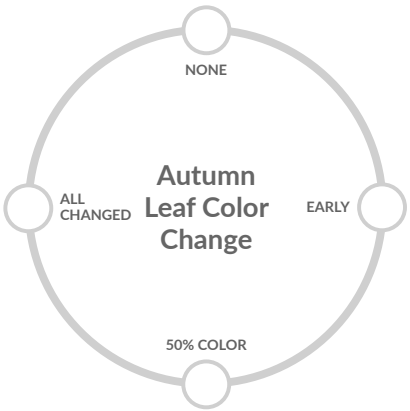
Longitude

What is your plant doing? Check the most applicable option for **each** category below.









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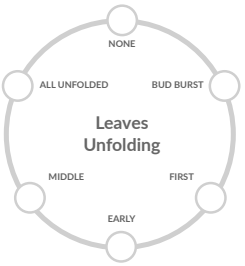
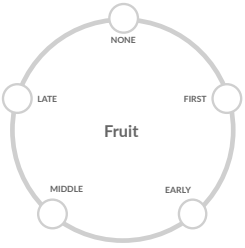
PHENOPHASE DEFINITIONS
DECIDUOUS TREES AND SHRUBS



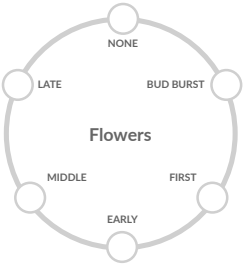
Leaves Unfolding

None - No new leaves visible.
Bud Burst - Protective scale coating is shed from the bud, exposing tender new growth of one or more leaves.
First - First leaves are completely unfolded from the bud on at least three branches. Leaves need to be opened completely (flat) and the leaf stem or base must be visible (you might need to bend the leaf backwards to see those).
Early - Only a few leaves have unfolded from the buds (less than 5%).
Middle - Half or more leaves have unfolded from the buds.
All Unfolded - All or most leaves are fully unfolded.



Fruit

None - No ripe fruits or seeds visible.
First - First fruits become fully ripe or seeds drop naturally from the plant on three or more branches. Ripening is often indicated by a change to the mature color or by drying and splitting open.
Early - Only a few ripe fruits or seeds are visible (less than 5%).
Middle - Half or more branches have fully ripe fruit or the seeds are dropping naturally from the plant. If fruits are in clusters or stalks, then record when at least one fruit is ripe on at least half of the branches.
Late - Most fruits or seeds have been dispersed from plant (over 95%).

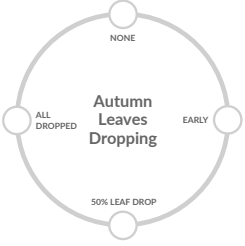


Flowers

None - No flowers or pollen visible.
Bud Burst - Flower sepals, the protective bud scales, have shed from the bud, exposing tender new growth tissues of one or more flower buds.
First - First flowers are fully open (stamens/pistils are visible) on at least three branches. When open, flowers on wind-pollinated trees and shrubs will release yellow dust-like pollen when touched.
Early - Only a few flowers have emerged (less than 5%) or pollen is just starting to disperse.
Middle - Half or more of the flowers are fully open or releasing pollen on three or more branches.
Late - Most flowers have wilted or fallen off (over 95%) or most pollen has fallen.

Autumn Leaf Color Change

None - No leaves have changed color.
Early - Only a few leaves have changed color (less than 5%).
50 Percent Color - Half or more of the branches have leaves that have started to change color.
All Changed - All or most leaves have changed color.



Autumn Leaves Dropping

None - No leaves have dropped.
Early - Only a few leaves have dropped (less than 5%).
50 Percent Leaf Drop - Half or more of the leaves have fallen off the tree or shrub.
All Dropped - All or most leaves have dropped.

budburst
A project of the Chicago Botanic Garden

PHENOLOGY OBSERVATIONS
WILDFLOWERS AND HERBS

When did you observe?

Date

Which plant did you observe?

Common Name or Scientific Name

Plant Nickname e.g. Backyard Lily. This helps you make another observation on this plant in the future.

Where did you make your observation?
Provide address **OR** latitude/longitude.

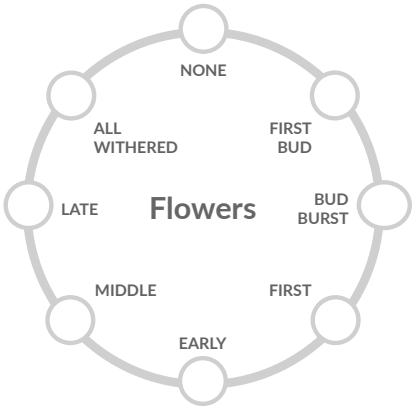
Address

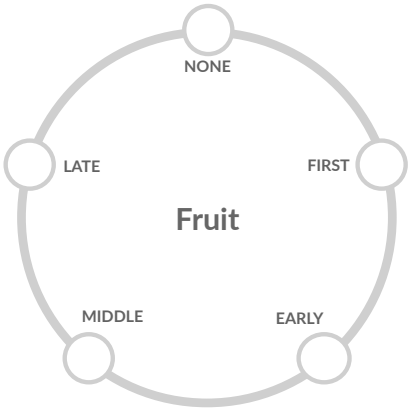
City, State/Province, Postal code

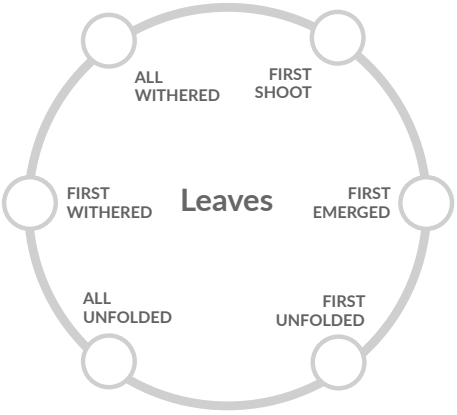
Latitude

Longitude

What is your plant doing? Check the most applicable option for **each** category below.







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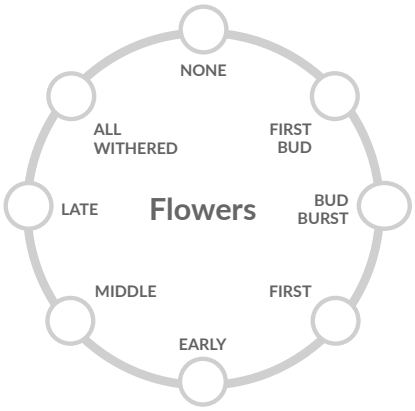
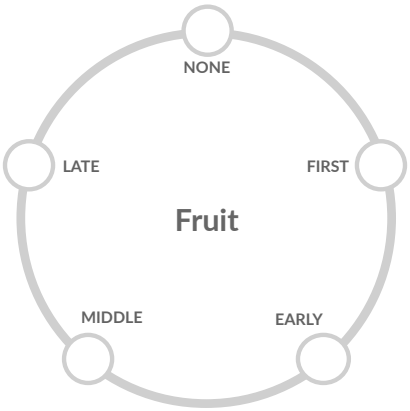
PHENOPHASE DEFINITIONS
WILDFLOWERS AND HERBS



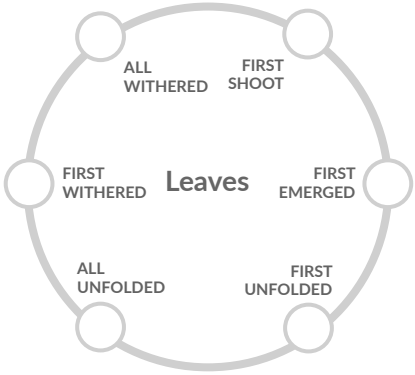
Flowers

None - No flowers or buds visible.
First Bud - First flower bud is visible.
Bud Burst - Flower sepals, also called bud scales, have opened to reveal the emerging flower. The color of the flower can be recognized.
First - First flower is fully open. When open, you will see the stamens/ pistils among the unfolded petals.
Early - Few flowers are open (less than 5%).
Middle - Half or more of the flowers are completely open.
Late - Most flowers have wilted or fallen off (over 95%).
All Withered - All flowers have wilted or fallen off.



Fruit

None - No ripe fruits or seeds are visible. There is no fruit, or fruit is not yet ripe.
First - First fruits are fully ripe or a few seeds are dropping naturally from the plant. Ripening is usually indicated by a change in color to the mature color, or by drying and splitting open (for dry fruits such as capsules).
Early - Only a few ripe fruits or seeds are visible (less than 5%).
Middle - Half or more of the fruits are completely ripe or seeds are dropping naturally from the plant.
Late - Most fruits or seeds have been dispersed from the plant (over 95%).



Leaves

First Shoot - First appearance of the growing shoot is visible above ground.
First Emerged - First leaf has emerged. The leaf shape should be clearly visible, but it can still be partly folded.
First Unfolded - First leaf has unfolded and is at least 75% of its mature size.
All Unfolded - All emerged leaves are fully visible in their mature form.
First Withered - First leaf, of those that developed this season, has lost its green color or is dried and dead.
All Withered - Most or all of the leaves that developed this season have lost their green color or are dried and dead.

budburst
A project of the Chicago Botanic Garden

PHENOLOGY OBSERVATIONS
GRASSES

When did you observe?

Date

Where did you make your observation?
Provide address **OR** latitude/longitude.

Address

Which plant did you observe?

Common Name or Scientific Name

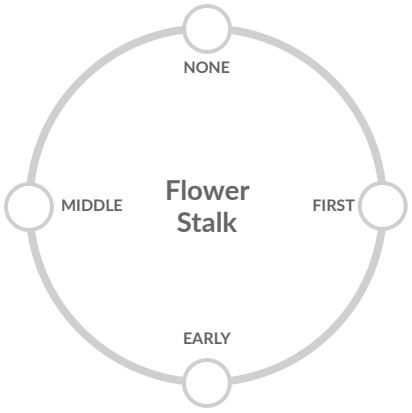
City, State/Province, Postal code

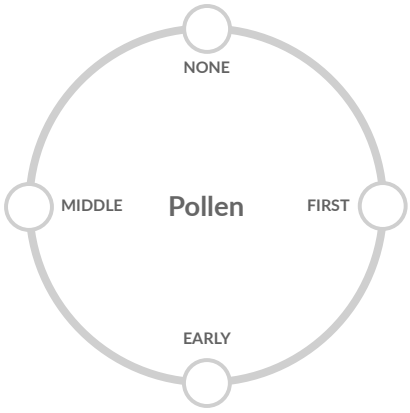
Plant Nickname e.g. Backyard Lily.
This helps you make another observation on this plant in the future.

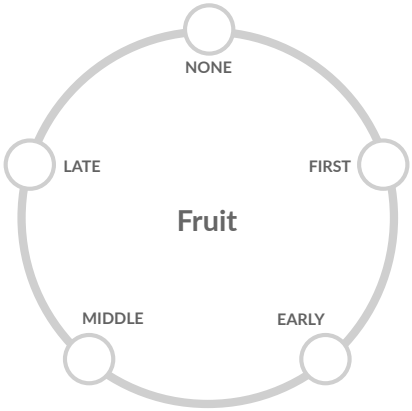
Latitude

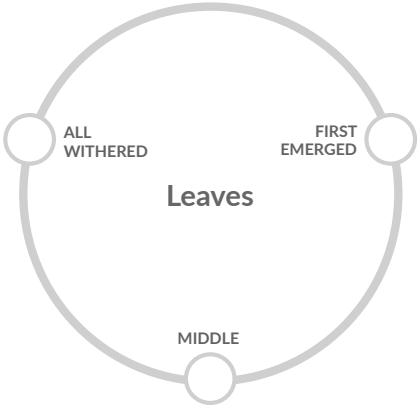
Longitude

What is your plant doing? Check the most applicable option for **each** category below.









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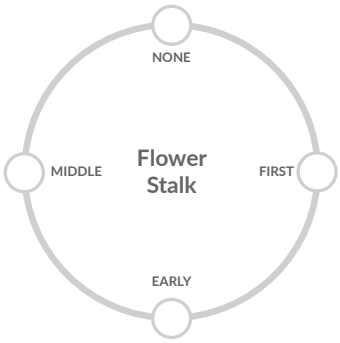
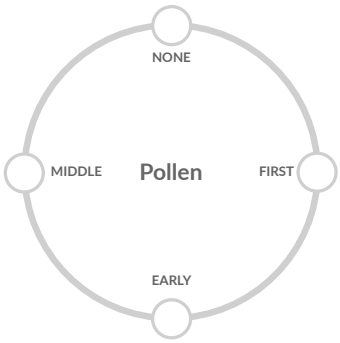
PHENOPHASE DEFINITIONS
GRASSES



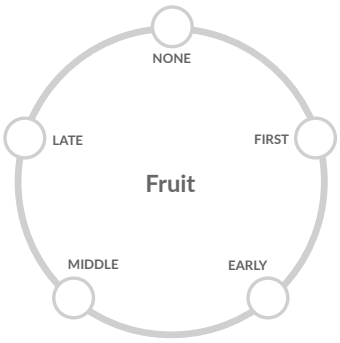
Flower Stalk

None - No flower stalks have emerged.
First - First flower stalk is emerging from the stem of the grass and you can see the first flower cluster (spikelet) rising above the leaves of the stem.
Early - Only a few flower stalks have emerged (less than 5%).
Middle - Many flower stalks have emerged.



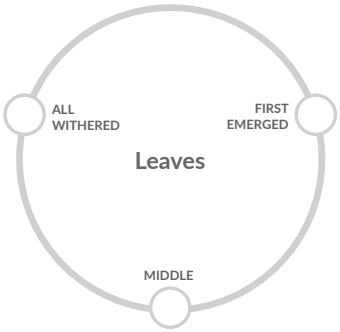
Pollen

None - No pollen is falling.
First - Plant starts releasing the powdery yellow pollen when touched. When open, grass flowers will release yellow pollen dust when touched.
Early - Some pollen is falling (less than 5%).
Middle - Half or more of the grass flowers are open and releasing pollen.



Fruit

None - No ripe fruits or seeds visible.
First - First fruits becoming fully ripe or seeds dropping naturally from the plant. For grasses, fruits are fully ripe when the seed is hard when squeezed and is difficult to divide with a fingernail.
Early - Only a few ripe fruits or seeds are visible (less than 5%).
Middle - Half or more of the fruits or seeds are fully ripe.
Late - Most fruits or seeds have been dispersed from plant (over 95%).



Leaves

First Emerged - First leaf has emerged. The leaf shape should be clearly visible above ground.
Middle - Most or all of the leaves that developed this season are green and healthy or green at their base. Note that cool-season grasses often die back during dry or hot periods, but are still green at the base of the leaves so are in the "middle" stage.
All Withered - Most or all of the leaves that developed this season have lost green color or are dried and dead. Note that cool-season grasses often die back during dry or hot periods, but are still green at the base of the leaves so have not yet reached the “all leaves withered” stage.

Phenology Bingo

Photo credit: USFWS Northeast Region

Grade Levels
6-8, 9-12

Overview
The following activity can be used as an introduction to the concept of phenology. The items on the phenology board are phenomena that participants have observed in nature, perhaps without even knowing their relationship to ecology, science, and climate, or their status as phenological events. Maybe they are fond childhood memories.

The activity increases science literacy by teaching about life-cycle events, encouraging students to recall experiences outdoors and spend more time observing things they may not yet have experienced.

Background
Phenology, or the study of the timing of life cycle events and their relationship to the environment, can be used to teach a number of scientific concepts in many grades from K through adult.

Real-world Connection
This activity is tied to observed plant and animal life cycles. It is also related to seasonal change because many of the events are associated with a particular season in a particular area. The concept of climate change may also be introduced, in the event that the timing has shifted since participants have been observing these events.

Citizen Science Connection
Nature's Notebook is not critical to completing the activity, rather can be used as an addendum to the activity.

Time Required
Ice-breaker: 20 mins

Traditional bingo game: 20 mins

PhenoBingo Relay Board Game: 40 mins

PhenoBingo Floor Game: 40 mins
Can be played indoors or outdoors with enough space for all purposes.

Learning Objectives
Participants will be able to:
- Define phenology
- Understand the influence of the changing seasons on life cycle events
- Understand the relationship between themselves and life cycle events in nature
- Make observations

Next Generation Science Standards

LS: Life Science			
Grades 6-8		Grades 9-12	
MS-LS1-4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.[1]	HS-LS2-6	Evaluate the claims, evidence, and reasoning that interactions in ecosystems are consistent in stable conditions, but changing conditions may result in a new ecosystem.[1]
MS-LS2-2	Construct an explanation that predicts patterns of interactions among organisms across mul-tiple ecosystems.[1]		
ESS: Earth and Space Systems			
MS-ESS3-5	Ask questions to clarify evidence of the factors that have caused the rise in global tempera-tures over the past century.		

[1] Can be elicited through the Explaining and Elaborating portion of the activity.

Conducting the Activity

Materials
Resources needed - depending upon the way you choose to present the activity
- PhenoBingo Worksheets
  NOTE: If you are not familiar with the items listed on the card, you may create your own events signifi cant to your local area. These items were created for the Tucson area. You probably know of many events such as these near you!
- Pencils/Pens (optional)
- Poster board (optional)
- 8.5 x 11 paper (optional)
- Laminating machine and paper (optional)
- Large Print out of PhenoBingo board (optional)
- Tokens to mark Bingo board (optional)
- 16 Beanbags (optional)

RESOURCES
Adapted from:

Nature Sleuths Scavenger Hunt by Alisa Hove and Sara Healey

NOTES ON ACTIVITY

Conducting the Activity

Experience

ENGAGE

1. Discuss the seasons. What do seasons bring to mind? Why do things occur when they do? How do seasons affect habitats and their inhabitants?

2. Definitions
   - Pheno- to show or appear
   - -ology-to study
   - Phenology- the science of reocurring plant and animal life cycle stages
   - Phenophase - An observable stage or phase in the annual life cycle of a plant or animal that can be defi ned by a start and end point.

3. Introduce the concept of phenology
   - All of the seasonal changes you talked about above are phenological events
   - What are some more examples you can think of? (migration, breeding, green-up, senescence)

Explore

OPTIONS FOR PLAY

Ice-breaker:

1. Using the included bingo card as a template, make enough copies for everyone. The second side is blank so participants can create their own events if necessary.

2. Instruct the participants to circulate the room and fi nd someone who has experienced one of the events on the sheet. When they fi nd someone, ask them to initial it.

3. The card is a conversation starter; the participants should circulate the room to fi nd someone who has experienced one of every item on the bingo card. As soon as a participant has found someone for each event, they are done.

Traditional Bingo Game:

1. Using the included bingo card as a template, create cards with the events in different orders.

2. Make enough copies of the bingo card for all participants.

3. Make a copy for yourself and cut the squares into individual cards. Place the cards into a bowl or a hat and begin by selecting one of the cards to read aloud.

4. Participants place a token on their card if they've experienced that event.

5. You may invite someone who has experienced that event to share a story related to it.

6. The first person to get 4 in a row, has bingo.

Conducting the Activity (continued)

PhenoBingo Relay Board Game:

1. Break the group into two teams.
2. Using two, poster board sized bingo boards and large tokens,create a relay race.
3. With a handful of token cards, the fi
4. rst participant in each grouphas to run to the table with the boards, read the board in front ofthem and select something that they have done. They place anitem on their selection.
5. The return to the line and hand the tokens to the next participantin line. Repeat this process until one of the teams has gotten 4 in a row.

PhenoBingo Floor Game:

1. Print out each event on an 8.5 x 11 sheet of paper. Laminate if you would like to reuse the event cards.
2. Lay the cards out in a grid with a little space between each card, depending upon the size of the area you have available.
3. The instructor stands near the grid, ready to read the cards when the beanbag lands on them.
4. The participants form a line some distance away from the grid. Far enough that they cannot easily read what is on the cards. The fi rst participant tosses a beanbag toward the grid.
5. The instructor reads aloud the event written on the card closest to the beanbag.
6. The participant who tossed the beanbag can choose to describe a time when they remember that event happening OR pass their turn to the next person in line.
7. The instructor can either leave the beanbag on the card where it landed and play until there are 4 in a row OR continue to play until all of the cards have been hit by a bean bag and all of the events have been described.

Share

EXPLAIN

1. Participants review the experience and reflect. Review ques tions can include:
   - Ask participants if they would like to join *Nature's Notebook* to collectobservations
   - What were the differences in our experiences?
   - Who had similar experiences?
   - Did anyone else want to share a time they experienced a similar event?
   - How did this activity demonstrate phenology, phenophases and seasonalchange?
2. This step may include a variety of sharing methods: verbal, illustrative, etc.

Process and Generalize

ELABORATE

How might we keep track of events like this? (e.g. nature journal, *Nature's Notebook*, photography, sketches, etc.).

Apply

EXTEND

1. Ask participants if they would like to join *Nature's Notebook* to collect observations
2. Host a *Nature's Notebook* workshop
3. Implement a long-term *Nature's Notebook* activity in your program

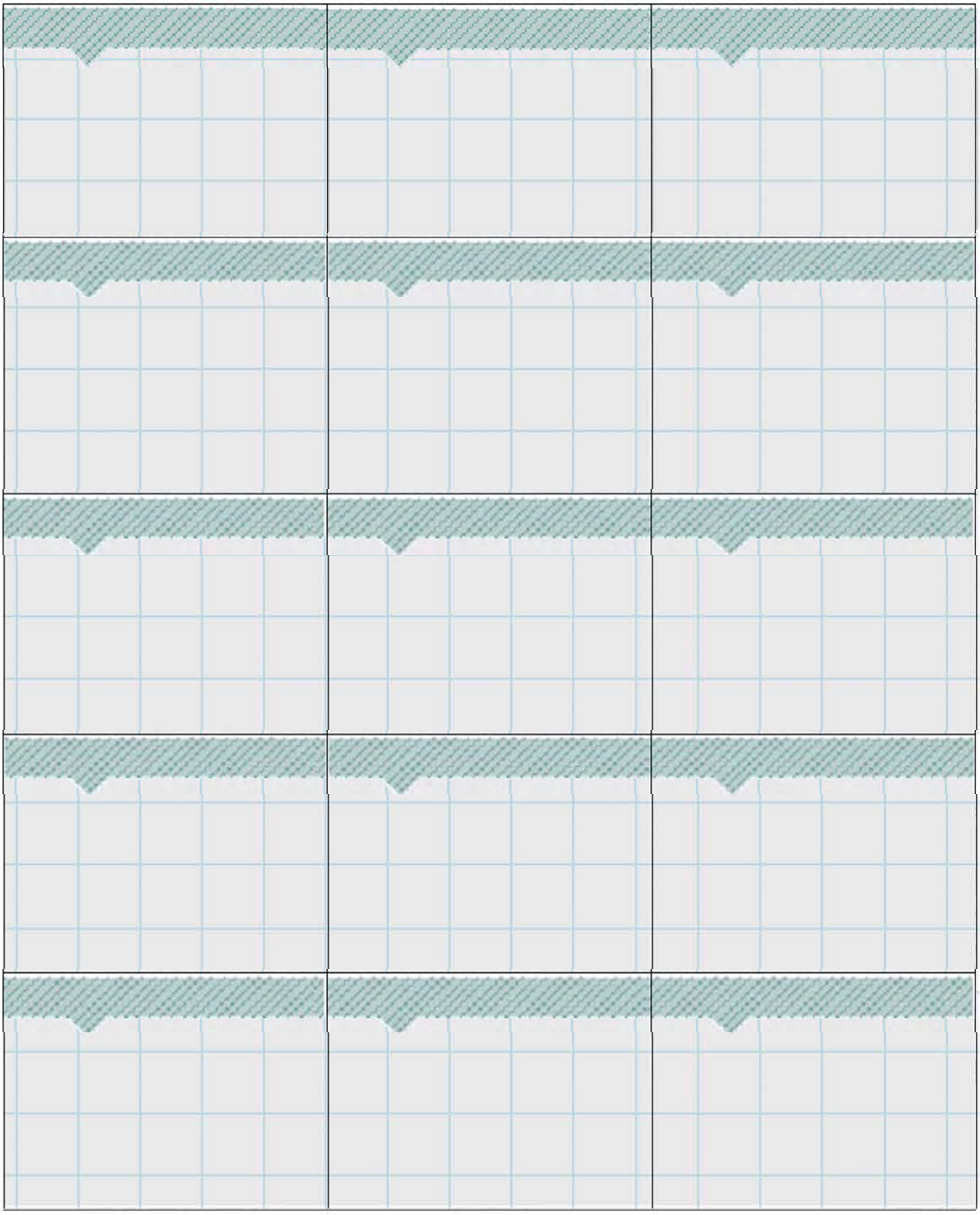
REFLECTION

1. Ask students to draw connections between this experience and other similar ones they have had.
2. Ask students about what they liked and disliked about this assignment. If they had to share the experience with someone else, what would they say?

Evaluate

The use of refl ective practice is critical to understanding. Examples of reflection questions include:

1. Share one new thing you learned from this experience.
2. Share one thing you still have a question about.
3. Share something that you learned which will be useful in the future.
4. Share something that I (the instructor) could have done differently, or will do differently in the future.
5. Share something that I (the instructor) learned from the participants.

NOTES ON ACTIVITY

Seen a saguaro bloom	Been a “leaf peeper”; seen leaves changing color in the fall	Seen a white winged dove visit a saguaro flower or fruit (pollination!)
Watched a monarch, swallowtail, or other butterfly or moth hatch	Watched bats emerge for an evening feeding session	Had an allergic reaction to mosquito bites
Smelled creosote bush after a rain	Suffered from seasonal allergies	Played with maple “helicopters” (seeds)
Made (or eaten) flour from mesquite beans	Seen a desert tortoise	Gone on a wildflower hike
Caught fireflies	Eaten food made from prickly pear fruits	Had a hummingbird visit a feeder in their yard