Pheno-Fun: Citizen Science Patch Program

Who

This patch program is for all Girl Scout levels!
The four, season-specific patches will be sold as a set and available for purchase in June 2022 at www.gssem.org/curbside.

What

Pheno—What?? Phenology!
Phenology (fee·**naa**·luh·jee) is the observation and measurement of events over time. While earning all four Pheno-Fun patch wedges, Girl Scouts become citizen scientists and uncover the mysteries of Michigan's seasons.

Girls earn each all four patches by exploring their backyards and communities or by attending hosted events in partnership with U.S. Fish & Wildlife Service (USFWS) and Detroit River International Wildlife Refuge (DRIWR).

As flowering trees start to bud, familiar bird songs fill the air, and amphibians stir from their deep winter's sleep, spring is the perfect time for Girl Scouts to embark on this patch program!

After they make exciting spring discoveries, girls investigate summer—a season when the natural world is vibrant, the days are long, and the best way to pass the time is by being outside.

As summer comes to a close, girls focus on autumn, when leaves turn an array of vivid colors, local birds migrate south, and mammals prepare to hibernate.

Befittingly, this patch program ends in winter, when girls examine the secret, quiet world hiding beneath the snow.

During this program:
Girl Scouts, will keep a nature notebook to track seasonal changes in the world around them—just like a scientist!

www.gssem.org/phenopatch

When

Find Pheno-Fun programs all year long:
www.gssem.org/phenofun

How

Pheno-Fun is a four-part patch program!
Each season, a patch may be earned by:

1. Attending a **virtual event** -AND-
2. Doing an **on-your-own activity** -OR-

   Attending a **GSSEM-sponsored activity** in partnership with USFWS and DRIWR.

   Virtual and in-person events are offered seasonally throughout the year.

You may even personalize your experience by combining on-your-own and in-person activities!

For an exciting, on-your-own activity, check out our Metroparks Explorer patch program at www.gssem.org/metropatch!

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Pheno-Fun Patch Program: Spring

Virtual Event

During the spring Pheno-Fun event, which will be hosted virtually by a DRIWR park ranger, attendees will be asked what signs they look for to indicate spring is coming.

After everyone shares their answers, we'll discuss key scientific details about spring, like:

Plant Growth
You'll learn the basic anatomy and life cycle of plants; how they're affected by season change; which plants grow in the spring; and how they make food and reproduce.

Bird Nests
You'll learn about different nest shapes; how they benefit different species of birds; what kinds of materials are used to make nests; and what a nest location says about a bird species.

On-Your-Own Activity

Grab your journal and pencil! Then, find a safe wooded area nearby where you can go on a walk and observe nature in the spring.

1. Take a few moments to sketch some of the newly emerging plant life and make notes of surroundingn animal behavior.
    - Are birds singing?
    - Do you hear or see squirrels or chipmunks bounding through the woods?
2. Look out for some natural items you think would make a great bird's nest and bring them back with you.
3. Try making your own bird's nest!
    - Use the materials you collected on your Springtime Scavenger Hunt to build your own bird nest.

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- Gather some random household items—like pipe cleaners, yarn, clothespins, toothpicks, popsicle sticks, etc—and wind them into your nest to strengthen it.

GSSEM-Sponsored Activity

Go on a Springtime Hike & Scavenger Hunt at Humbug Marsh in Trenton! A park ranger will guide you on the trail, so you'll have the perfect opportunity to practice plant identification—and possibly see different types of bird nests.

1. Grab a journal and pencil with you before you head out! Take a few moments to sketch some of the newly emerging plant life and make notes of surrounding animal behavior.
    - Are birds singing? Do you hear or see squirrels or chipmunks bounding through the woods as they search for food?
2. When you're done with the hike, you'll have the opportunity to make your own bird's nest using various materials supplied by USFWS and DRIWR.

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Springtime Scavenger Hunt

Observation Checklist

- ☐ Find three different species of budding trees.
- ☐ Find lingering signs of winter.
- ☐ Find three different species of insects.
- ☐ Find a uniquely shaped rock.

Journal Checklist

Please note findings in your journal for the following:

- ☐ How many different flowers do you see? What color is the largest?
- ☐ How many different birdsongs can you here?
- ☐ What's the youngest living thing you can find?
- ☐ Take a second to smell the earth. What type of aroma does it have? Do you detect different scents?
- ☐ Stop, close your eyes, and listen closely.
  - ☐ Do you hear running water? Where do you think it's coming from?
  - ☐ How many different sounds do you hear?
- ☐ Look for mud. Do you see any animal tracks? If so, which animal do you think they belong to?
- ☐ Do you see any insects? What do they look like? How do they move?
- ☐ Try to spot a worm. In inches, how long do you think it is?
- ☐ Find something you perceive as ugly. What makes its appearance unpleasant to you? How could you look at it differently for you to consider it beautiful?

List Five Things You Like About Spring

1. _____
2. _____
3. _____
4. _____
5. _____

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Springtime Scavenger Hunt

Bonus Challenge: Try to Find These Organisms & Objects!

Bird nest

Pinecone

Bird

Blossom Tree

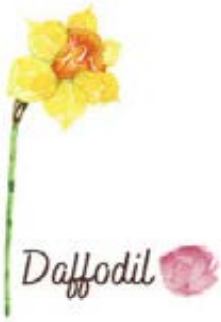
Bird House

Bee

Bird eggs

Snowdrops

Tulips



Daffodil

Twig

Buds

Willow buds

Snail

Grass

Butterfly

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Pheno-Fun Patch Program: Summer

Virtual Event

During the summer Pheno-Fun event, which will be hosted virtually by a DRIWR park ranger, attendees will be asked to describe what comes to mind when they think about summer. Do they notice anything different about local animals, insects, or plants?

After everyone shares their answers, they'll discuss key scientific details about summer, like:

Wildlife Adaptations: Summer & Future Seasons
Life flourishes in the summer, and every living thing needs to adapt to survive. Why does the fur of a white-tailed deer change? After squirrels store food all over the forest, how do they remember where to find it?

Adaptation & Predator/Prey Dynamics
We'll discuss the ways local plants and animals adapt to survive year-round as well as the predator/prey dynamics in Humbug Marsh.

On-Your-Own Activity

Grab your journal and pencil! Then, find a safe, nearby wooded area where you can go on a hike and focus on how nature adapts around you.

1. Find a spot to sit quietly for about 15 minutes and observe animals nearby.
    - How do animals behave differently in the summer than in the spring?
    - How has their appearance changed?
2. Create a new animal you think would be the perfect predator. Give it a name and draw it!
    - It could have eagle eyes, the speed of a mountain lion, and elk antlers—a lelk!
    - As a bonus, create the perfect prey to escape from your new super predator.

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GSSEM-Sponsored Activity

Go on a summer "Adapations" hike at Humbug Marsh in Trenton! A park ranger will guide you on the trail, so you'll have the perfect opportunity to see how wildlife adapts to its surroundings.

1. Grab a journal and pencil with you before you head out! Take a few moments to record the behavior and appearance of animals, plants, and insects you encounter on your hike.
    - How do they behave differently in the summer than in the spring?
    - How has their appearance changed?
2. When you're done with the hike, the park ranger will lead a fun, hands-on game to learn about predator/prey relationships.

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Summer Scavenger Hunt

Observation Checklist

- ☐ Find three different shades of green.
- ☐ Find an animal's home.
- ☐ Find a stick that's exactly your height.
- ☐ Find a leaf that's as big as your hand.
- ☐ Find three different types of seeds.
- ☐ Find a cloud shaped like an animal.
- ☐ Find something sharp and prickly.
- ☐ Try to find five pieces of litter and throw them away.
  Note: Remember to wear protective gloves!

Journal Checklist

Please note findings in your journal for the following:

- ☐ Find a pretty rock. What color is it?
- ☐ If you were a thirsty animal, where would you find a drink around here?
- ☐ If you were a bird, where would you build your nest? Why?
- ☐ Look around you. Do you see anything that looks out of place? What is it?
- ☐ Find something red. What is it?
- ☐ Take off your shoes and walk on the grass. Describe how it feels.
- ☐ Close your eyes and listen. What sounds do you hear?

List Your Three Favorite Summer Activities

1. _____
2. _____
3. _____

Summer Scavenger Hunt

Bonus Challenge: Try to Find These Organisms & Objects!


Grasshopper


Pinecone


Bird


Leaf


Fly


Bee


Twig


Ladybug


Sunflower


Stump


Butterfly


Tree


Daisy


Snail


Grass

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Pheno-Fun Patch Program: Fall

Virtual Event

During the summer Pheno-Fun event, which will be hosted virtually by a DRIWR park ranger, attendees will be asked to describe what comes to mind when they think about fall. Do they know what the big change in the forest is called when the leaves change color?

After everyone shares their answers, they'll discuss key scientific details about fall, like:

The Season of Migration
How, where, and why do birds migrate? What about plants?

Leaf Senescence
Learn the scientific process of leaves changing color in the fall. What causes this and why?

Energy Cycles in a Forest
Discover how leaf litter and other decomposing organic matter in the forest turn into an energy source, as well as where decomposition fits on the "forest energy cycle" chart.

On-Your-Own Activity

Grab your journal and pencil! Then, find a safe, nearby wooded area to explore.

1. While on your hike, sketch the birds you see.
    - Compared to the summer, do you notice a difference in species? How has their appearance changed?
2. Find and record the same types of plants you sketched in the summer.
    - How have they changed?
3. Spend some time outside collecting leaves.
    - Try to collect five different-color leaves and bring them home with you.
      Tip: Your journal is a great place to store them!

www.gssem.org/phenofall

4. With your leaves, do the *Find the Hidden Colors of Fall Leaves* experiment.
5. Do the *Exploding Seed Pod* activity to learn how plants disperse their seeds.

GSSEM-Sponsored Activity

Play the Migration Challenge Relay game and do the Autumn Scavenger Hunt at Humbug Marsh in Trenton! A park ranger will guide you on the trail, so you can collect different-color leaves.

1. Grab your journal and a pencil! While on your hike, sketch the birds you see and hear.
    - How has their appearance changed since the summer?
2. Find and record the same types of plants you sketched in the summer.
    - How have they changed?
3. When you're done with the hike, use your collected leaves to do the *Find the Hidden Colors of Fall Leaves* experiment.
4. Do the *Exploding Seed Pod* activity to learn how plants disperse their seeds.

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Fall Scavenger Hunt

Observation Checklist

- ☐ Find a large, red leaf.
- ☐ Find the smallest yellow leaf nearby.
- ☐ Find something that smells sweet.
- ☐ Find some rough bark.
- ☐ Find some smooth bark.
- ☐ Find a smooth pebble that fits in the palm of you hand. Take it home and paint it.
- ☐ Close your eyes and feel the wind on your face.
- ☐ Look for an old bird's nest.

Journal Checklist

Please note findings in your journal for the following:

- ☐ Find an animal sign, like tracks, a feather, a bone, etc. What animal do you think was here?
- ☐ Locate two different types of grass. How are they different?
- ☐ Listen for bird calls. How many different calls do you hear?
- ☐ Try to find a flower. What color is it?
- ☐ What's the most beautiful thing that you can find?
- ☐ How many different shades of brown can you find?
- ☐ Pretend you're a squirrel. Where would you hide your food to prepare for the winter?

List Your Three Favorite Fall Activities

1. _____
2. _____
3. _____

Fall Scavenger Hunt

Bonus Challenge: Try to Find These Organisms & Objects!

Mushroom

Pinecone

Birdhouse

Maple Leaf

Oak Leaf

Acorn

Twig

Squirrel

Sea buckthorn

Corn

Sunflower

Tree

Stump

Chestnut

Pumpkin

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Find the Hidden Colors of Fall Leaves

Introduction

Have you ever wondered why leaves change colors in the fall?

Leaf color is caused by pigments made up of various, color-creating molecules. During warm, sunny months, plants use their leaves to turn sunlight into food—a process called photosynthesis. This primarily uses a pigment that reflects green light.

When days get colder and shorter in the fall, deciduous trees stop making food with their leaves and no longer need the green pigment. Other leaf pigments become visible.

During this experiment, you'll uncover the hidden colors of fall by separating plant pigments with a process called paper chromatography.

Background

There are many pigments in leaves. Chlorophyll makes them green and performs photosynthesis during warmer months. As the green pigment fades in the fall, other pigments—like yellow, orange, and red—become visible.

Xanthophylls are yellow, and carotenoids are orange. Photosynthesis also uses these pigments during the summer, but chlorophyll is a stronger pigment and overpowers them. Also, these pigments take more time to break down than chlorophyll, so you they become more prominent in fall. There are also anthocyanins, which are an intense red and only appear in the fall.

Using a method called paper chromatography, you can separate a leaf's color pigments. This process dissolves the pigments and allows them to be absorbed by a strip of paper. Larger molecules have a harder time moving in the woven paper and get trapped in the paper first, whereas smaller ones travel farther along the paper. This process separates the mixture of pigments by molecular size and color.

Needed Materials

- Leaves at five different color stages
  Note: The more the better! About five of each color is best.
- A pair of scissors
- 3–4 drinking glasses
- Rubbing alcohol (isopropyl alcohol)
- A wooden utensil with a blunt end that can crush leaves, like a wooden spoon
- A fork
- 3–4 very small bowls
- Strong, white, heavyweight, ultra-absorbent paper towels
- A ruler
- A pencil
- Toothpicks
- A plate or other surface to protect your working area from stains
- 3–4 tall glass jars, like mason jars
- 9–12 clothespins or large paper clips

Preparation

- Collect leaves at different stages of color change in the fall, preferably from the same tree.
  Note: Make sure you get leaves that are fresh, not crispy.
- Ask an adult to be your experiement partner!
- Separate your leaves into distinct color groups — green, yellow, and red—with about five large leaves in each group.
- Prepare 15 paper towel strips approximately 1" wide. They should be long enough to touch the bottom of your tall glass jars while still extending over the top.
- With a pencil, gently draw a horizontal line 1" from the bottom of each strip.

Find the Hidden Colors of Fall Leaves

Procedure

- Use scissors to cut the leaves into small pieces, and then place each group of leaves at the bottom of its own drinking glass.
- Add one tablespoon of rubbing alcohol to each glass.
- Using the blunt end of a wooden utensil, crush the leaves into the rubbing alcohol for about five minutes, until the solution is dark. How has the color of the alcohol changed?
- Let the solution sit indoors, in a dark place, for 30 minutes.
- While leaving the liquid in the glasses, use a fork to remove and throw away all leaf remnants in each solution.
- Pour each solution into its own very small bowl and leave it in a dark place indoors to give the alcohol more time to evaporate. When you stir each solution with a toothpick and it seems thicker, you're ready for the next step.
- Use toothpicks to thoroughly mix the solutions. To make sure you don't mix colors, use a different toothpick for each glass.
- Using a toothpick for each color, smoothly and evenly "paint" some of each solution across a paper towel strip on the pencil line you previously drew. For each color, do this using a total of three or four strips.
  Note: Because some plant pigments can stain, you should do this on a plate or other non-staining surface.
- Allow the strips to dry.
- While the strips are drying, pour enough rubbing alcohol into each tall glass jar to cover just the bottom. Prepare one jar for each color solution.
- With the dry strips, carefully put the pigmented end into the jar until the strip barely touches the alcohol. Drape the top of the strip over the jar's opening and secure it with a clothespin or paper clip. Make sure each strip is only touching the jar where it's secured, not the side.
- Place and secure strips from the same solution into the same jar, but keep them from touching each other.
- Let the glasses sit for 30 minutes and watch the paper strips. What's happening to the colors?
- When one of the colors reaches the top of a strip, remove all of the strips and let them dry.
- Look at each dried strip. How are the colors different? Do strips from different solutions have unique colors, shared colors, or both?
- Look at the order in which colors appear on different strips. Is the same color at the same place on different strips—or is it at a different place? Do the colors appear in the same separation order or are they separated differently?

Observations & Results

Using paper chromatography, you were able to separate pigments by the size of their molecules. You should see varying colors at different locations along each strip. Also, the order in which the colors appear should be roughly the same as each different color solution.

Were you able to see multiple bands of color on your test strips? Did you see that some bands differed for different solutions? What are the varying bands of color on the test strips? These are the different pigments in the leaves. The ones you may see on your paper towel strips are green chlorophylls, yellow xanthophylls, orange carotenoids, and red anthocyanins.

Pigments with larger molecules generally stay near the bottom of the strip—where you "painted" on the pencil line—because it's harder for them to travel up the woven fiber of the paper towel. Smaller pigments can more easily climb the paper towel and, consequently, they usually travel farther up the strip.

Because leaf color is dependent on pigments, each displays differently on a paper towel strip. Ex: A strip testing vibrantly green leaves may not show any shades of red (anthocyanins).

Exploding Seed Pod Activity

Do this activity to see how some plants, like milkweed, disperse their seeds to repopulate!

Needed Materials

- A funnel
- A large balloon
- A sharp pencil to pop the balloon
- A tarp or bedsheet to spread on the ground outside
- Small seeds, like birdseed
- A ruler or measuring tape
- Activity observation sheets

Instructions

1. Ask an adult to be your activity partner!
2. Stretch the open end of the balloon snugly over the small end of the funnel and then go outside.
3. Slowly and carefully pour the seeds down the funnel and into the balloon. This is your seed pod!
4. Fully blow up the balloon, tie the open end into a knot, and set it aside.
5. Spread your tarp or bedsheet on the ground.
6. Hand the balloon to your partner and ask them to hold it still.
7. Take your sharp pencil and carefully pop the balloon.
8. Observe what happens to the seeds when the balloon pops.
9. Follow the directions on your datasheet to complete the project.

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Exploding Seed Pod Observations: Page I

Draw what you observed and label the components.

Did all of your seeds land on your tarp/bedsheet, or did some make it even further?

Measure the distance your seeds traveled from the pod, and label the drawing with your measurements.

Exploding Seed Pod Observations: Page II

How can you design a seed pod using a balloon, funnel, pencil, and seeds?

Draw your model:

How does your model show tension building in a seed pod before it bursts?

Draw how you created tension:

Test your model outside. How did you make your pod explode?

What did you see when your pod burst?

Pheno-Fun Patch Program: Winter

Virtual Event

During the winter Pheno-Fun event, which will be hosted virtually by a DRIWR park ranger, attendees will be asked to describe what comes to mind when they think about winter. Do they notice anything different about local animals, insects, and plants?

After everyone shares their answers, they'll discuss key scientific details about summer, like:

Overwintering
What Michigan animals do you think hibernate in the winter? What about plants and insects? In what ways do you think animals, plants, and insects adapt to survive the winter?

Shelter & Food Adaptation
We'll discuss how animals find food if it's buried under the snow and how they change shelters and/or locations to adapt to changing seasons.

On-Your-Own Activity

Grab your journal and pencil! Then, find a safe, wooded area where you can go on a winter walk.

1. Try to find animal markings in the snow—similar to the ones you learned about during the virtual event.
    - Do you see any owl wing imprints?
    - What about imprints from an animal's nose, mouth, and paws that were left behind as it pounced through the snow?
2. Look closely for places that might be good winter shelters for animals.
   Remember what you learned about camouflage!
    - Do you see any tree hollows?
    - Can you find a pine tree that doesn't have snow around the base of its trunk?

3. Take a moment to sketch your observations in your nature journal!

GSSEM-Sponsored Activity

Go on a winter hike at Humbug Marsh in Trenton! A park ranger will guide you on the trail, so you'll have the perfect opportunity to search for animals' winter habitats.

1. Grab a journal and pencil with you before you head out! Take a few moments to sketch and your findings.
2. Learn what strategies animals use to adapt during the winter months for survival.
3. Learn about the art of camouflage.
4. Learn about overwintering and hibernation strategies that plants, insects, and animals use to survive colder temperatures.
5. When you're done with the hike, the park ranger will lead everyone in the Woodchuck Breathing activity.

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Winter Scavenger Hunt

Observation Checklist

- ☐ Find three different types of animal tracks.
- ☐ Find something hard.
- ☐ Find something soft.
- ☐ Find five different icicles.
- ☐ Find some trees that haven't lost all of their leaves.
- ☐ Find a sign that another human was here before you.

Journal Checklist

Please note findings in your journal for the following:

- ☐ Pretend you're a squirrel and it's nighttime. Where would you sleep?
- ☐ Do you see any animals moving? What kind?
- ☐ What's the most beautiful thing that you can find?
- ☐ Stop and look up. What shapes do you see in the clouds?
- ☐ Now, look down. What's the smallest living thing you can find?
- ☐ Take a second to smell the earth. What type of aroma does it have? Do you detect different scents?
- ☐ What's the brightest thing you can find?
- ☐ Stand still and look around. What's the oldest thing you can see?
- ☐ If you had to build a fire, where would it be?
- ☐ If there's snow, make a snowball and toss it in the air. What sound does it make when it hits the ground?

List Your Three Favorite Winter Activities

1. _____
2. _____
3. _____

Winter Scavenger Hunt

Bonus Challenge: Try to Find These Organisms & Objects!

Bird

Pinecone

Barberries

Bare Tree

Bird House

Blueberries

Cardinal

Evergreen Tree

Twig

Holly

Pine Branch

Acorn

Animal Footprints in the snow

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