

## Photo Description



This image shows a lawn completely covered with fallen leaves in autumn colors—bright reds, yellows, oranges, and browns. The leaves are resting on green grass, and a house with a basketball hoop is visible in the background. This is what happens every fall when trees drop their leaves before winter arrives.

## Scientific Phenomena

**Anchoring Phenomenon:** Deciduous trees shed their leaves in fall, covering the ground with colorful fallen foliage.

**Why This Happens (Scientific Explanation for Teachers):**

As daylight decreases and temperatures drop in autumn, deciduous trees respond to these environmental cues by reducing water transport to their leaves. This triggers the breakdown of chlorophyll (the green pigment), revealing underlying pigments like carotenoids (yellows/oranges) and anthocyanins (reds/purples). The tree creates a protective layer (abscission zone) at the leaf stem, causing leaves to separate and fall. This adaptation helps trees conserve water and energy during the cold, harsh winter months when water is frozen in the soil and unavailable for uptake. This is a survival strategy refined over millions of years of evolution.

## Core Science Concepts

- \* **Seasonal Change:** Earth's tilt causes seasons to change throughout the year. Fall is when many trees lose their leaves as temperatures drop and days get shorter.
- \* **Tree Life Cycles:** Different types of trees respond differently to seasons. Deciduous trees (like oak, maple, and birch) lose all their leaves in fall, while evergreens keep their needles year-round.
- \* **Color Change in Leaves:** Leaves appear green because of a pigment called chlorophyll. When chlorophyll breaks down in fall, we see other colors underneath—yellows, oranges, and reds that were always there.
- \* **Plant Survival Strategies:** Trees drop their leaves to save water and energy when it's cold. This helps them survive the winter when water in the ground freezes.

### Pedagogical Tip:

Use the "color reveal" concept to help first graders understand that the vibrant fall colors were always in the leaves—they just couldn't see them under the green. This makes the abstract concept of pigment breakdown more concrete and less mysterious. You might compare it to wearing a yellow shirt under a green jacket: when you take off the jacket, the yellow appears!

### UDL Suggestions:

**Multiple Means of Representation:** Display real fallen leaves alongside pictures so students can examine them closely. Provide color-coded diagrams showing how green fades to reveal other colors. **Multiple Means of Action/Expression:** Allow students to sort leaves by color, create leaf mosaics, or draw their observations rather than only writing about them. **Multiple Means of Engagement:** Connect to students' personal experiences: "Have you played in leaves? What did they feel like? Smell like?" This makes the science phenomenon personally relevant and emotionally engaging.

## Zoom In / Zoom Out

### Zoom In: Inside the Leaf (Cellular Level)

Deep inside each leaf are tiny structures called chloroplasts that contain chlorophyll—the green pigment. When fall arrives and days get shorter, the tree stops sending water and nutrients to the leaves. The chlorophyll breaks down into smaller pieces and disappears, like a green blanket being pulled away. Underneath, yellow and red pigments that were always there but hidden become visible! It's like the leaf was wearing green camouflage the whole time. This happens at such a small scale that we can't see it without a microscope, but the colorful result is visible to our eyes.

### Zoom Out: Earth's Seasonal System (Planetary Level)

This single yard full of fallen leaves is part of a much bigger pattern happening across the entire Northern Hemisphere. As Earth tilts away from the sun during fall and winter, millions of trees across forests, parks, and neighborhoods all drop their leaves at around the same time. This creates a worldwide seasonal rhythm: leaves fall !' decompose and feed the soil !' nutrients help spring plants grow !' summer trees photosynthesize !' fall comes again. This cycle has been happening for hundreds of millions of years and connects plants, animals, soil, water, and sunlight into one interconnected system we call an ecosystem. Even this single backyard is part of that global web of life!

## Discussion Questions

1. What do you notice about the colors of the leaves on the ground? (Bloom's: Remember | DOK: 1)
2. Why do you think trees drop their leaves when it gets cold? (Bloom's: Analyze | DOK: 2)
3. If you were a tree, how would dropping your leaves help you survive the winter? (Bloom's: Evaluate | DOK: 3)
4. Compare the leaves in this picture to leaves you see in spring. What is different? Why do you think that happens? (Bloom's: Analyze | DOK: 2)

## Potential Student Misconceptions

Misconception 1: "Trees die in the fall and then come back to life in spring."

Clarification: Trees don't die when they lose their leaves—they go to sleep, like when you rest before a big day! The tree is still alive underground in its roots and trunk. It's saving energy and water so it can survive the cold winter. In spring, when it gets warm again, the tree "wakes up" and grows new leaves. It's a natural cycle, not death and rebirth.

Misconception 2: "All trees lose their leaves in fall."

Clarification: Only some trees, called deciduous trees, lose their leaves in fall. Other trees, called evergreens (like pine and spruce trees), keep their needles all year long—even in winter! Both types of trees are smart in their own way: deciduous trees save water by dropping leaves, while evergreens have special waxy needles that don't lose water as easily.

Misconception 3: "The leaves change color because they're getting ready to die."

Clarification: The color change isn't a sign of death—it's a sign of survival! The colors were always hiding under the green. When the tree stops making new green chlorophyll, we finally see the beautiful yellows, oranges, and reds that were underneath the whole time. It's like the leaves are showing their true colors before they fall and help feed the soil!

## Extension Activities

1. Leaf Color Sorting and Pattern Hunt: Take students on a nature walk to collect fallen leaves. Back in the classroom, sort leaves by color (reds, yellows, oranges, browns). Create a color graph showing which colors appeared most often. Discuss: "What colors appeared the most? Why?" This builds observation, classification, and data skills.

2. Leaf Decay Investigation: Place fallen leaves in clear plastic bags with moist soil. Store in a cool place and observe over 4-6 weeks (time permitting into winter). Draw pictures or take photos weekly to document how leaves break down and return to the soil. This introduces decomposition and nutrient cycling in an age-appropriate way.

3. Seasonal Tree Bulletin Board: Create a large tree outline on bulletin board paper. Have students place leaves, drawings, and photos on the tree representing fall. Plan to change the display seasonally (bare branches in winter, buds in spring, full canopy in summer). This reinforces the cyclical nature of seasonal change.

### Cross-Curricular Ideas

#### Math Connection: Leaf Counting & Graphing

Collect a basket of fallen leaves and have students count them by color. Create a simple bar graph or picture graph on chart paper: "How many red leaves? How many yellow leaves? Which color do we have the most of?" Students can also skip-count by twos or fives if working with large quantities. Ask: "If we have 10 red leaves and 7 yellow leaves, how many leaves do we have altogether?" This builds addition skills while reinforcing the observation data.

#### ELA Connection: Descriptive Writing & Sensory Poetry

Have students observe fallen leaves closely and describe what they see, feel, smell, and hear. Create a class sensory poem together using a simple frame: "Fall leaves are \_\_\_\_\_ (red/yellow/soft/crispy). They feel \_\_\_\_\_. They smell \_\_\_\_\_. They sound \_\_\_\_\_." Individual students can illustrate their own leaf poem or contribute one line to a class "Fall Leaves Poem" bulletin board. This builds vocabulary and helps students connect science observation to creative expression.

#### Art Connection: Leaf Art & Color Mixing

Use real fallen leaves or leaf cutouts to create mosaics, collages, or nature mandalas. Students can also paint with leaf prints, dipped in washable paint, to create patterns. Introduce basic color mixing: "What happens if we mix yellow and red paint together?" This connects the chlorophyll concept to art and helps students understand that colors come from mixing other colors, just like how pigments combine in nature.

#### Social Studies Connection: Community Helpers & Seasonal Responsibilities

Discuss what community helpers do in fall: landscapers rake leaves, street cleaners collect leaf piles, waste management workers compost leaves. Take a neighborhood walk and observe which houses have raked leaves and which haven't. Discuss: "Why do people rake leaves? Where do the leaves go?" This teaches students about community roles and seasonal work while reinforcing that fallen leaves have a purpose in the larger system.

### STEM Career Connection

#### Botanist (Plant Scientist)

A botanist is a scientist who studies plants—how they grow, why they change colors, and how they survive different seasons. A botanist might spend time in gardens, forests, or labs looking at leaves under microscopes or measuring how tall trees grow. They help us understand why leaves turn colors in fall and how to take care of plants. Botanists work for universities, nature centers, and parks. Average Annual Salary: \$63,000–\$75,000 USD

#### Meteorologist (Weather Scientist)

A meteorologist is a scientist who studies weather and climate patterns. They measure temperature, rainfall, and day length—all the things that trigger trees to drop their leaves! Meteorologists help predict when fall will arrive and how cold the winter will be. They work for weather stations, schools, and government agencies. Average Annual Salary: \$60,000–\$80,000 USD

#### Landscape Designer

A landscape designer plans and creates beautiful outdoor spaces like gardens, parks, and yards. They choose different types of trees and plants based on the seasons and decide where to plant them so they look colorful in fall. They also help design spaces where fallen leaves can be composted or recycled. Landscape designers work for parks, schools, and homeowners. Average Annual Salary: \$50,000–\$70,000 USD

### NGSS Connections

Performance Expectation: K-ESS2-1 Plan and conduct investigations to provide evidence that objects in motion can be pushed or pulled and have different forces acting upon them (not directly applicable); however, this lesson aligns with broader K-2 Earth Science standards.

Disciplinary Core Ideas:

- K-LS1.A Structure and Function (trees have structures that help them survive)
- K-ESS2.E Dynamics of Earth's Systems (weather patterns and seasonal changes)

Crosscutting Concepts:

- Patterns The pattern of leaf color change repeats every fall
- Cause and Effect Shorter days and cooler temperatures CAUSE trees to drop leaves

### Science Vocabulary

- \* Leaf: The flat, usually green part of a plant that catches sunlight and helps the plant make food.
- \* Deciduous: A tree that loses all of its leaves when fall comes and grows new ones in spring.
- \* Season: A time of year with certain weather patterns and changes in nature (spring, summer, fall, winter).
- \* Chlorophyll: The green color in leaves that helps plants make their own food using sunlight.
- \* Autumn (or Fall): The season between summer and winter when leaves change color and fall off trees.
- \* Pigment: A natural color in leaves that we can only see when the green color goes away.

### External Resources

Children's Books:

- Why Do Leaves Change Color? by Betsy Maestro (explains seasonal science in simple language)
- Fall Leaves: A Counting Book by Loretta Holland (combines math and seasonal observation)
- Come On, Rain! by Karen Hesse (focuses on weather and seasons)

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Teacher Tip: This lesson is best taught in early-to-mid fall when leaf color change is happening in real time in your local environment. Students learn better when they can observe the phenomenon directly!