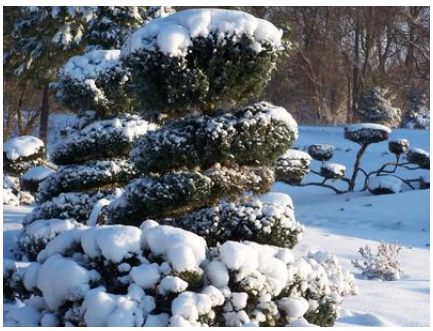
# Winter Seasons

Earth & Space Science | Lesson Guide

4th Grade

## Photo Description



This image shows evergreen trees heavily covered with thick snow and frost during winter. The snow has accumulated on all the branches, bending them downward under the weight. In the background, you can see bare deciduous trees and a frozen or snow-covered pond, showing how different trees respond differently to winter conditions.

## Scientific Phenomena

Anchoring Phenomenon: Why does snow stick to evergreen trees during winter?

Snow accumulates on evergreen branches because of how the branches grow and their surface texture. Evergreen trees have needle-like leaves (or small flat needles) that point outward in many directions, creating a large surface area for snow to collect on. When temperatures stay near freezing and snow is wet and heavy, it sticks more easily to these surfaces. Additionally, the evergreen's cone or pyramid shape and dense branching pattern naturally trap and hold snow. The weight of accumulated snow can actually bend the branches downward, as you can see in this photo. This is a seasonal pattern that happens repeatedly each winter in snowy climates.

## Core Science Concepts

* States of Matter and Phase Changes: Water exists in three states—solid (ice/snow), liquid (water), and gas (water vapor). Snow is frozen water that forms in clouds and falls to Earth when conditions are cold enough.

* Seasonal Weather Patterns: Winter brings predictable changes in temperature, precipitation, and daylight hours. Snow is a form of precipitation that occurs in cold climates during winter months.

* Plant Adaptations to Winter: Different trees have adapted differently to survive winter. Evergreen trees keep their needles year-round, while deciduous trees drop their leaves to conserve water and energy during cold months.

* Properties of Snow and Accumulation: Snow has low density compared to liquid water, but when compressed or when wet snow sticks together, it becomes heavy and can exert significant weight on objects like tree branches.

**Pedagogical Tip:**

Rather than simply telling students "snow is frozen water," allow them to observe and compare real samples: fresh snow, compressed snow, and ice. Ask them to predict which will melt fastest and why. This hands-on comparison deepens their understanding of how water's properties change with temperature and density—key concepts for this grade level.

**UDL Suggestions:**

Multiple Means of Engagement: Some students may have limited experience with snow if they live in warm climates. Provide high-quality images, videos, or virtual tours of snowy landscapes. Pair visual learning with tactile experiences (if possible, using ice and water in the classroom) and discussions about winter in different regions. This honors diverse student backgrounds while building conceptual understanding.

## Zoom In / Zoom Out

Zoom In: The Microscopic World of Snowflake Formation

When you look at a single snowflake under a microscope, you'll see it has a beautiful six-sided crystal structure. This happens because water molecules arrange themselves in a specific pattern as they freeze. Each snowflake's unique shape depends on the temperature and humidity in the cloud where it forms. Even though millions of snowflakes pile up on the tree branches in this photo, each tiny crystal is perfectly formed at the molecular level. The branches in the photo are covered with billions of these microscopic ice crystals locked together!

Zoom Out: The Winter Ecosystem and Water Cycle

When you step back and look at the whole landscape in this photo—the frozen pond, the snow-covered ground, the bare trees, and the evergreens—you're seeing an entire winter ecosystem in action. This snowy forest is part of a larger water cycle where snow falls from clouds, accumulates on the land, and eventually melts in spring to flow into streams and ponds. The evergreen and deciduous trees are both adapted to survive this seasonal pattern. The snow also insulates the soil and protects small animals, seeds, and plant roots underground from the harshest cold. All these parts work together as one connected system.

## Discussion Questions

1. Why do you think the evergreen tree's branches are bending down so much while the bare trees in the background are standing straight? (Bloom's: Analyze | DOK: 2)

2. Compare how this evergreen tree looks in winter to how you think it looks in summer. What is the same, and what is different? (Bloom's: Evaluate | DOK: 3)

3. If the temperature rose and the snow began to melt, what do you predict would happen to the tree branches first? (Bloom's: Predict/Synthesize | DOK: 3)

4. Why do you think it's important for evergreen trees to be flexible and able to bend under the weight of snow? (Bloom's: Evaluate | DOK: 3)

## Potential Student Misconceptions

Misconception 1: "Snow is just frozen rain."
Clarification: While both rain and snow are precipitation, they form differently. Snow forms directly in cold clouds when water vapor freezes into ice crystals without first becoming liquid water. Rain forms from water droplets in warmer clouds. Snow and rain are two different paths water takes depending on temperature.

Misconception 2: "All trees lose their leaves in winter, so they're all dead."
Clarification: Evergreen trees don't lose their needles in winter—they keep them year-round! The needles are specially adapted to survive freezing temperatures. Deciduous trees drop their leaves on purpose to rest and save energy during cold months, not because they're dead. Both strategies help trees survive winter, just in different ways.

Misconception 3: "Snow makes trees stronger because it adds weight to them."
Clarification: Actually, heavy snow can damage or even break tree branches because of the weight pressing down on them. That's why you see the branches bent so far down in this photo! Trees survive this by being flexible and bending rather than breaking. Once the snow melts, the branches spring back up.

## Extension Activities

1. Snow Observation Journal: If your area gets snow, have students observe and sketch snow-covered trees or objects over several days. Ask them to record observations about how much snow accumulated, which objects hold the most snow, and how the snow changes as temperatures fluctuate. This reinforces observation skills and understanding of seasonal patterns.

2. Build a Winter Landscape Model: Using white playdough or papier-mâché, students can construct miniature evergreen and deciduous trees, then use shaving cream or cotton balls to simulate snow accumulation. This tactile activity helps them understand structural differences between tree types and visualize how snow affects different branches.

3. Water State Exploration Station: Set up a classroom station with ice cubes, snow (if available), liquid water, and a heat source (like a sunny windowsill or lamp). Students make predictions about which states of water will change and how, then observe the transitions from solid to liquid to gas (evaporation). Connect this to the photo by explaining that the snow in the photo could eventually melt and evaporate.

## Cross-Curricular Ideas

Math Connection: Measuring Snowfall and Weight
Have students measure the depth of snow on different objects (if available locally, or use pictures from the photo). Create bar graphs comparing snowfall amounts on evergreen branches versus flat ground. Calculate how much snow might weigh on a tree branch by measuring branch dimensions and estimating snow volume. This builds data collection and measurement skills while connecting to the photo's content.

ELA Connection: Descriptive Writing and Winter Poetry
Ask students to write detailed descriptions of what they see in the photo using sensory words (sparkly, heavy, white, silent, cold). Challenge them to write winter poetry or acrostic poems about snow, evergreen trees, or seasonal changes. They could also write from the perspective of a tree branch under heavy snow: "Dear Snow, Please stop piling on me..." This develops descriptive vocabulary and creative expression.

Social Studies Connection: Winter Around the World
Explore how different regions and cultures experience winter differently. Compare snowy winters in places like Canada, Japan, or Alaska with milder winters in warmer climates. Research how indigenous peoples and modern communities in snowy regions adapted their homes, clothing, and activities to winter conditions. Discuss why some people have never seen snow. This builds global awareness and understanding of human adaptation to environment.

Art Connection: Winter Landscape Collage and Texture Study
Students create winter landscape collages using white, silver, and blue materials (paper, foil, cotton, fabric) to represent snow and ice on trees. Have them experiment with different textures to show the contrast between fluffy snow and icy branches. They could also create a series of drawings showing the same tree across all four seasons, illustrating how evergreens and deciduous trees change throughout the year.

## STEM Career Connection

Meteorologist (Weather Scientist) | Average Salary: $97,000/year
Meteorologists study weather and climate patterns, including how snow forms and accumulates. They predict winter storms, measure snowfall, and help people prepare for severe winter weather. A meteorologist might analyze satellite images to track snowstorms heading toward forests, or study how climate change affects snow patterns in different regions. They work for weather services, news stations, and environmental agencies.

Forestry Technician or Forest Ecologist | Average Salary: $45,000–$68,000/year
Forest ecologists study how trees survive in different seasons and weather conditions, including winter snow. They monitor tree health, study which species thrive in snowy climates, and help manage forests to prevent damage from heavy snow loads on branches. They might work for national forests, state parks, or environmental research organizations, spending time outdoors observing trees in all seasons.

Climate and Environmental Scientist | Average Salary: $75,000–$105,000/year
These scientists study how Earth's climate and seasonal patterns are changing over time. They analyze data about snowfall, temperature, and precipitation to understand if winters are getting warmer or snowier. They use this information to predict how ecosystems and forests might change in the future. Their work helps communities prepare for winter weather and understand Earth's changing climate.

## NGSS Connections

Performance Expectation:
4-ESS2-1: Make observations and measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

Disciplinary Core Ideas:
* 4-ESS1.A - The repeating patterns of seasons result from Earth's tilt and orbit around the sun
* 4-ESS2.A - Rainfall helps shape the land and affects the types of living things found in a region

Crosscutting Concepts:
* Patterns - Seasonal weather patterns repeat year after year
* Cause and Effect - Cold temperatures cause water to freeze into snow; snow accumulation causes branches to bend

## Science Vocabulary

* Evergreen: A tree or plant that keeps its green needles or leaves all year long, even during winter.

* Precipitation: Water that falls from clouds to Earth, including rain, snow, sleet, and hail.

* Accumulation: The process of something collecting or building up over time, like snow piling up on branches.

* Seasonal: Something that happens at a particular time of year, like snow in winter or flowers in spring.

* Deciduous: A tree that loses all its leaves in the fall and grows new ones in the spring.

* Frost: A thin layer of ice crystals that forms on surfaces when water vapor freezes directly into ice without becoming liquid first.

## External Resources

Children's Books:
Stranger in the Woods* by Carl R. Sams II and Jean Stoick — Beautiful photography of winter wildlife and snow-covered landscapes
Come On, Rain!* by Karen Hesse — While focused on rain, this teaches about water and precipitation cycles in accessible language
Winter Trees by William Carlos Williams (poetry) or Trees of Winter* by James Kavanagh — Illustrated guides to identifying winter trees