

## Photo Description



This image shows a pond that is beginning to thaw in spring, with water visible through melting ice along the shoreline. Bare trees stand at the water's edge, and patches of dead brown grass and exposed soil cover the ground where snow has melted. A simple fence marks property boundaries near the water.

## Scientific Phenomena

**Anchoring Phenomenon:** Seasonal ice melting and the transition from winter to spring.

**Why This Happens:** As Earth tilts on its axis during spring, the Northern Hemisphere receives more direct sunlight and experiences warmer temperatures. This increased heat energy melts the solid ice that formed on the pond's surface during the colder winter months. Water changes from its solid state (ice) to its liquid state (water)—a process called melting. This is a natural seasonal cycle that happens every year in temperate climates.

## Core Science Concepts

1. **States of Matter:** Water exists in three states—solid (ice), liquid (water), and gas (water vapor). Temperature changes cause water to change from one state to another.
2. **Heat Energy and Temperature:** Heat energy from the sun causes ice to melt. The warmer the temperature, the faster ice melts.
3. **Seasonal Changes:** Earth's tilt causes seasons to change throughout the year, bringing predictable changes in temperature and weather patterns.
4. **The Water Cycle:** Melting is one part of the continuous water cycle, where water moves between the atmosphere, land, and bodies of water.

### Pedagogical Tip:

Consider having students predict what they think will happen to this pond over the next few weeks. Revisit the image or take a similar photo at different times to track actual changes. This builds scientific thinking and helps students see that science involves careful observation over time, not just one-time observations.

### UDL Suggestions:

**Multiple Means of Representation:** Provide the photo alongside a simplified diagram showing ice melting into water. Some students may benefit from a tactile experience—allow them to observe ice melting in a cup in the classroom (with proper supervision). **Multiple Means of Action & Expression:** Let students document their observations through drawing, writing, or even acting out the melting process with their bodies.

### Zoom In / Zoom Out

Zoom In (Microscopic Level):

At the molecular level, ice is made of water molecules arranged in a rigid, organized crystalline structure. When heat energy is added, these molecules vibrate faster and break apart from their fixed positions, allowing the substance to flow as liquid water. The molecules themselves don't change—only their arrangement and movement change.

Zoom Out (Ecosystem & Watershed Level):

This single pond is part of a much larger water system. Melting water from this pond flows into streams and rivers, eventually reaching larger bodies of water. This seasonal melting is critical for aquatic ecosystems—fish and other organisms depend on the return of liquid water and the nutrients it carries. The melting also affects groundwater levels and can influence soil moisture for plants across the entire watershed.

### Discussion Questions

1. "Why do you think the ice on this pond melted, but the trees are still bare and brown?" (Bloom's: Analyze | DOK: 2)
  - This encourages students to think about different rates of change in nature.
2. "What do you predict will happen to this pond in the summer? Why?" (Bloom's: Predict/Evaluate | DOK: 3)
  - This promotes higher-order thinking about seasonal patterns and cause-and-effect.
3. "Where do you think the melted ice water goes?" (Bloom's: Understand/Analyze | DOK: 2)
  - This connects to the water cycle and helps students understand systems.
4. "How would this pond look different if Earth were tilted the opposite way during this time of year?" (Bloom's: Evaluate/Synthesize | DOK: 3)
  - This pushes students to think about Earth's tilt and its role in seasons.

### Potential Student Misconceptions

1. Misconception: "Ice disappears completely when it melts."
  - Clarification: Ice doesn't disappear—it changes form. The ice becomes water (liquid) and stays in the pond. The water is still there; it just looks different and behaves differently.
2. Misconception: "The ice melts because the air gets warmer, and warmth is a thing that flows into the ice."
  - Clarification: Heat is energy that moves from warmer places to cooler places. The sun's energy warms the air and ice. This energy causes the ice molecules to move faster until they become liquid water.
3. Misconception: "All the water will eventually disappear from the pond."
  - Clarification: Some water does evaporate (turns into water vapor and goes into the air), but the pond is refilled by rain, melting snow, and groundwater. The water cycle keeps water moving but doesn't make it vanish permanently.

### Extension Activities

1. "Melting Race Experiment":

Students place identical ice cubes in different locations (sunny window, shaded corner, warm water bowl, freezer) and time how long each takes to melt. They record observations and discuss why some melted faster. This directly connects heat energy to the rate of melting.
2. "Pond Journal Over Time":

If possible, take photos of the same pond location weekly throughout spring. Have students create a visual timeline showing how the pond changes. They can draw or paste photos and write predictions about what will happen next.

### 3. "States of Matter Station Activity":

Set up stations with ice, water, and a heat lamp (supervised). At each station, students observe and describe the properties (color, shape, texture, flow) of water in different states. They sketch and label what they see, reinforcing that the same substance can look and act very differently depending on temperature.

## Cross-Curricular Ideas

1. Mathematics: Have students measure the depth of water at different points in the pond (if safely accessible) or measure ice thickness before and after melting. Create bar graphs comparing melt rates under different conditions.
2. English Language Arts: Read aloud books about spring or seasons, then have students write their own "Spring Observation" narrative describing changes they see in nature. They can compare their observations to the photo.
3. Social Studies: Discuss how seasonal changes affect human communities. How do farmers prepare land in spring? How do ice fishers and water sports enthusiasts change their activities? Connect this to the idea that people must adapt to natural cycles.
4. Art: Have students create a mixed-media artwork showing the transformation of ice to water to water vapor. They might use cotton balls for water vapor, blue paint for water, and aluminum foil or white paper for ice, arranged vertically to show the progression.

## STEM Career Connection

1. Hydrologist: A scientist who studies water in all its forms—where it comes from, how it moves, and how it affects Earth. Hydrologists track melting snow and ice to predict flooding and manage water supplies for cities. They might measure how much water a thawing pond contributes to rivers. Average Annual Salary: \$84,000 USD
2. Environmental Scientist: These professionals monitor ecosystems and how they change with seasons and climate. They study how melting ice affects plants, animals, and water quality in ponds and streams. Average Annual Salary: \$73,000 USD
3. Climate Scientist: Climate scientists study long-term weather patterns and temperature changes on Earth. They track how warming temperatures are changing when ice melts and how this affects seasons worldwide. Average Annual Salary: \$96,000 USD

## NGSS Connections

Performance Expectation:

- 4-PS3-1: Use evidence to construct an explanation relating the speed of an object to the energy of that object.
- 4-PS3-4: Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

Disciplinary Core Ideas:

- 4-PS3.A
- 4-LS1.A
- 3-ESS2.A

Crosscutting Concepts:

- Energy and Matter
- Patterns

- Systems and System Models

### Science Vocabulary

- \* Melting: The process where a solid (like ice) turns into a liquid (like water) when it gets warm.
- \* Ice: Water that has frozen and become solid because the temperature is very cold.
- \* Heat Energy: The energy from the sun or heat sources that makes things warmer.
- \* Temperature: How hot or cold something is, measured in degrees.
- \* Seasonal Change: The way weather and nature change throughout the year in a regular pattern (spring, summer, fall, winter).
- \* Water Cycle: The continuous movement of water from the sky to Earth and back again through evaporation, condensation, and precipitation.

### External Resources

Children's Books:

- Spring by Gerda Muller (observational picture book about seasonal change)
- The Reason for a Flower by Ruth Heller (explains seasonal cycles and plant life)
- Come On, Rain! by Karen Hesse (poetic story about water and seasons)