



Snow on the Micro-Level

Overview: Students will discover the insulating effect of snow and understand that temperature varies according to snow depth. Students will also learn what the subnivean zone is and how it helps animals survive the winter.

Grade Level: K-5, 6-8, 9-12

Subject(s): Science

Topic(s): Earth Science/weather

Great Lakes Literacy Principles:

3. The Great Lakes influence local and regional weather and climate.
4. Water makes Earth habitable; fresh water sustains life on land.
5. The Great Lakes support a broad diversity of life and ecosystems.

Materials:

Thermometer

Clipboard

Paper

Pencil

Shovel

Microscopes or Magiscopes

Glass Microscope Slides

Petrie Dishes

Cooler

Microscope slide coverslips

Ruler

Standards:

WI standards for English Language Arts

SL.1.2: Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

SL.1.4 Describe people, places, things, and events with relevant details, expressing ideas clearly.

SL.6.2 Interpret information presented in diverse media and formats and explain how it contributes to a topic, text, or issue under study.

SL.7.4 Present claims and findings, emphasizing significant points in a focused, coherent manner using relevant evidence. Communicate clearly and in an engaging manner, considering the audience, purpose, and situation. Explain purpose of language choices.

SL.8.4 Present claims and findings, emphasizing significant points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details. Communicate clearly and in an engaging manner, considering the audience, purpose, and situation. Explain purpose of language choices.

SL.9-10.4 Present information, findings, and supporting evidence such that listeners can follow the reasoning and organization. Intentionally utilize development, substance, and style appropriate to purpose, audience, and situation.

NGSS:

SCI.LSI.D.1. Students use science and engineering practices, crosscutting concepts, and an understanding of structures and processes to understand that animals sense and communicate information and respond to inputs with behaviors that help them grow and survive to make sense of phenomena and solve problems.

SCI.LS2.C.3. Students use science and engineering practices, crosscutting concepts, and an understanding of structures and processes to understand that when the environment changes, some organisms survive and reproduce, some move to new locations, some move into transformed environments, and some die to make sense of phenomena and solve problems.

SCI.LS4.C.3. Students use science and engineering practices, crosscutting concepts, and an understanding of structures and processes to understand that particular organisms can only survive in particular environments.

Wi Standards for Environmental Literacy:

ELS.EX5.B.i: Describe how living things respond to changes in natural systems. Explain how changes affect how organisms adapt and survive. Observe and compare changes in weather and climatic patterns and how each affects natural systems.

Lesson Preparation:

1. This lesson requires cold petri dishes for the preservation of snow so that it can be observed under a microscope once you return to the classroom. In preparation petri dishes should be set in the freezer overnight.

Lesson Procedure:

1. Divide students into groups to take and record temperatures and collect snow samples. (Be sure that all students have a chance to take some of the temperatures).
2. Have groups predict where the temperature will be the warmest—air, surface of snow, 4 in. below surface, 8 in. below surface, 12 in. below surface—and why.
3. Go outside and have each group use the shovel to dig a “pit” in the snow at different locations.
4. Have them take temperatures at the following locations: the air temperature above the snow (*supranivean temperature*); the temperature at the surface of the snow and every four inches below the surface (*intranivean temperature*) down to ground level if possible (*subnivean temperature*). Have them record their temperatures in a table. (Template at the end of lesson)
5. Using the Petrie dishes, have the students collect a sample of snow at each level also. Place these samples in a chilled cooler.
6. Return to class and take some time to look at each layer of snow under a microscope. You should see different crystal patterns at different levels of the snowpack.
7. The snow will start to melt, that’s okay. It will be a worthwhile observation for the students to see the snow melt from its solid form to its liquid form, water. This is a very clear demonstration of the states of matter and how they can change.
8. In discussion, compare temperatures and layer observations.
 - a. How are the temperatures the same or different and why?

- b. Did anyone notice any differences in your observations of the snow layers as you took the temperatures?
- c. What did you notice about the different layers of snow when you looked at them under the microscope?
- d. What do they think could have caused that?
- e. How might these differences affect animals struggling to survive in the winter?
- f. Why might small animals want to stay under the snow on a cold day?

Evaluation: Have each group share whether their prediction was correct or incorrect. Have each group present their data and explain why the temperatures are different at each level. Have each group define subnivean, supranivean, and intranivean.

Vocabulary:

SUBNIVEAN- below the snow

SUPRANIVEAN- above the snow

INTRANIVEAN- within the snow

Resources:

- [Snow layers](#) – National Avalanche Center [Video]
- [Types of Snow](#) – Frontier Scientists [Video] (1:45 shows different layers in snowpack)
- [Snow Metamorphism](#) – WSL Institute for Snow and Avalanche Research SLF [Webpage]
- [The Facet Factory An Introduction to Snow Metamorphism](#) – US Forest Service [Webpage]
- [The Properties of Snow](#) – How Stuff Works [Webpage/Photos]
- [The science of snowflakes](#) – TedEd [Video]

Teacher Comments:



What's Happening in the Snow?

Name: _____

Date: _____

You get to use a thermometer and a ruler to investigate a snow bank.
So DIG IN!

Hypothesis:

Where do you think the temperature will be the warmest?

Depth in Snow	Observations of Layer (hard, soft, crunchy, smooth, bumpy...)	Temperature (F)
Air		
Surface of Snow		
Pit		
4 inches Below Surface		
8 in Below Surface		
12 in Below Surface		
16 in Below Surface		
20 in Below Surface		