



SNOWSCHOOL

1st Grade Activities for Schools *Surrounded by Snow!*

About this Guide:

The SnowSchool program was created in 2001 to introduce America's youth to the joy of exploring winter wildlands. Since those early beginnings the program has grown into national network of dozens of sites. Today many SnowSchool sites are located in nature centers, Nordic centers, national forests, national parks and ski areas that engage thousands of participants each winter. This model has worked effectively for reaching students in urban areas, but in many rural mountainous areas students don't need to get on a bus and drive to a nature center to explore the wilds of winter-- they have public land right out the front door of their school. To take better advantage of this opportunity, SnowSchool is now collaborating with schools that are "surrounded by snow" to develop a new program model designed especially for this context. This represents one critical approach in an increasingly diverse array of strategies that WWA is using to connect kids with nature and help them understand the importance of our nation's public lands. By combining our nationally recognized snow science curriculum with fun outdoor exploration, SnowSchool participants gain both an emotional connection to winter wildlands and a greater understanding of their important ecological role.

Table of Contents

Intro to the SnowSchool Curriculum	2
Snow Science Background Information	3
One page overview of Activities	4
Activity 1: Preparing for Snow (Review)	5
Activity 2: Snow Crystal Cards	6
Activity 3: Animal Ambulation	7
Activity 4: Snowshoe Hare Ears	8
Activity 5: Light, Ice, Water and Snow Experiment	9

This program guide was compiled by Kerry McClay, Winter Wildlands Alliance National SnowSchool Director. For more information about SnowSchool or WWA contact Kerry at kmcclay@winterwildlands.org

The SnowSchool Curriculum

The SnowSchool program aims to inspire a lifelong interest in exploring the wonders of our winter wildlands. Thus the curriculum that accompanies the program is designed to match the interest and abilities of individuals as they grow through life. SnowSchool has been around long enough that, in some places, the first generation of students have now grown up and become educators!

SnowSchool also strives to be much more than a limited “one-and-done” field trip program. Research conducted on the SnowSchool model and field-trips in general demonstrates that in order to maximize student benefits these learning experiences must extend over time and connect classroom study to the field-trip itself. We’ve designed a spiraling curriculum model (right) to do just this, and the details of how to make it happen at your site are captured here in this guide.

Additionally the SnowSchool curriculum is designed to align with existing state science standards, the newer Next Generation Science Standards and the Common Core State Standards. This is important component of the program because SnowSchool is intended contribute to K-12 students’ overall learning and academic achievement. Also, when field-trips are aligned with teachers’ required curriculum it makes it much easier for them to justify their students’ participation. Details regarding this curriculum alignment appear throughout this document.

Between 2012 and 2017 Winter Wildlands Alliance conducted a series of evaluations of the program’s science curriculum. For this evaluation hundreds of students completed pre and post SnowSchool science quizzes. The results showed that when students participated in three simple and specific experiential snow-science/water-cycle activities during the SnowSchool program, dramatic increases in student science learning occurred. These “three essential” activities are fun, help students learn through firsthand experience and encapsulate an important theme of ecological interconnectedness between snowpack, watershed systems and human use of water. To fit into the context of a K-12 school that is surrounded by snow, the SnowSchool three essential activities (snowpack depth assessment, snow/water equivalency experiment and watershed map) have been modified to help students explore these topics each year during their entire K-12 career (hence the spiraling curriculum). Together these activities combine to create a powerful learning experience that solidifies the connection between nature, science and the students’ own lives.

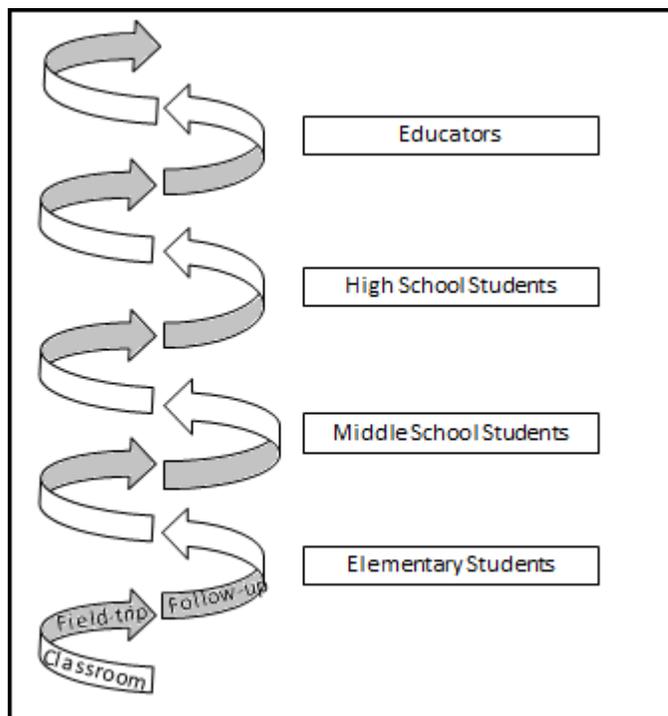


Figure 1: SnowSchool's spiraling curriculum model enables students at a variety of grades levels to explore snow science and ecology in a manner that connects classroom study, field excursions and follow-up extension projects. Eventually SnowSchool students might one-day become volunteer SnowSchool educators and continue their learning through teaching, self-guided study and ongoing SnowSchool trainings.

Snow Science Background Information:

To better understand the relevance of the SnowSchool curriculum you may want to review some of these foundational science concepts.

- **Snow science** is a current field of science exploring questions in three main realms- Water Supply (*How much water do we get from snow?*), Avalanche Forecasting (*What types of snow conditions produce avalanches?*) and Climate Science (*How is annual snowfall and global snow distribution changing over time?*) The SnowSchool program focuses primarily on exploring snow science in the context of Water Supply and Climate Science.
- Snow is part of the **Water Cycle**. Water cycles through the Earth's landscape in an endless process and goes through many changes along its way from the ocean to the mountains and back again. The sun heats the liquid water in oceans and lakes causing the liquid to **evaporate**, or turn into a gas. The water molecules then rise on warm air currents into the atmosphere where they begin to cool which causes **condensation**. Condensation of water molecules from a gas to a liquid usually occurs around a dust particle. When enough molecules condense clouds begin to form. If the condensation process occurs at temperatures below 32 degrees F then ice crystals begin to grow from the water and form **snow crystals** or flakes. Once enough water molecules condense either as a liquid (rain) or as a solid (snow) and join together, they get heavy enough to fall back to the earth. This is called **precipitation**.
- A watershed is an area of land where all the water drains to the same place. Most watersheds are named by the river or stream to which they drain. The start of the watershed is located high above at the tops of the surrounding mountains.
- Accumulated mountain snow, usually referred to as the **snowpack**, is a critical component of many watersheds. When it melts it provides liquid **runoff** water for plants, animals and fish in streams and rivers, as well as for human needs such as irrigation and drinking water. In the Western US, for example, snow provides 75-80% of the annual water supply (that's eight out of every 10 glasses students drink at home)! Domestic and commercial use, irrigation supply and recreation are a few of the social and economic impacts that snowpack has on a region. Understanding the important ecological connection between a local community and its snowpack is an essential SnowSchool goal.
- **Depth** is an important measurement of the snowpack that is monitored closely by scientists. Because of factors like elevation, sunlight, shade, plants, temperature and wind the depth of the snowpack varies immensely.
- **Density** is another important measurement of the snowpack that is monitored closely by scientists. Because of factors like melting/freezing temperatures, crystal size/shape, snowpack weight and wind loading, the density of snow can vary greatly within the snowpack. Because the density of water never changes, the density of snow is synonymous with water content. For example, if you melted a container of snow and discovered it was half water, you could say that the density of the snow was 50%.
- **Snow water equivalent** is the depth of water that would result if you instantaneously melted all the snow on the ground in a specific location.

1st Grade One-Page Curriculum Outline

Group: Classroom of students from Adams Elementary 1st Grade

Focus: Snow Science and Winter Ecology

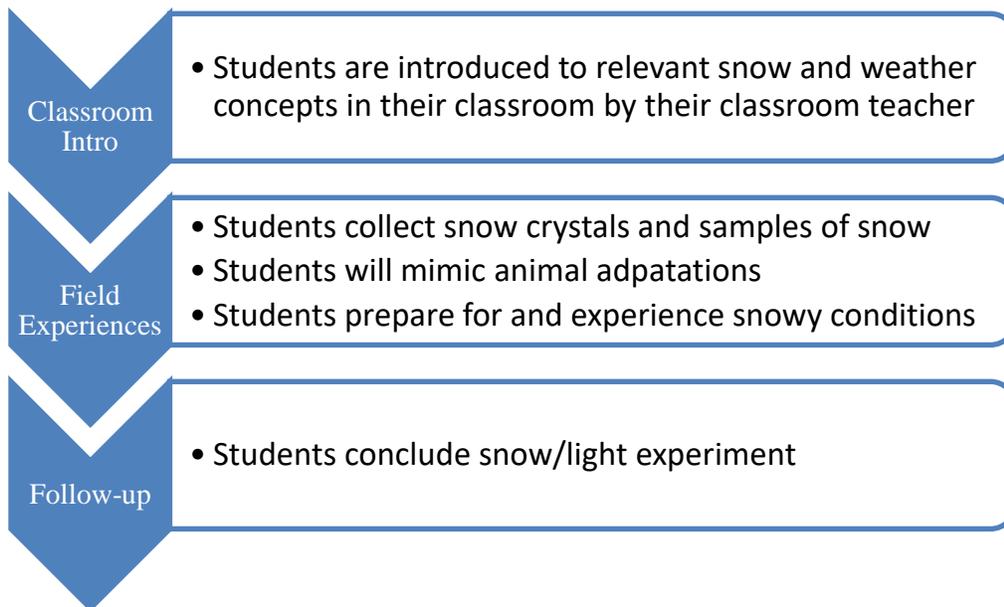
Objectives (what we want the students to learn):

- Students will learn about the basic properties of snow
- Students will learn about basic animal adaptations for winter survival
- Students will learn about preparing themselves to be out in snowy weather

Outcomes (how we will know the students learned):

- Students will have the opportunity to collect snow crystals and snow samples
- Students will make observations to determine the effect water, ice, and snow on light
- Students will prepare for being outside in winter weather and for walking in snow

Three Phases of the SnowSchool experience:



Preparing for Snow

(Note: This is a review of the activity for Kindergarten students)

How to do it:

#1 Introduce the Forecast: On a day when it is likely to snow talk with the students about the forecast. Why do we have a forecast? How does it help us prepare? How should we prepared for a snowy forecast? Discuss appropriate clothing for cold and snowy weather.

#2 Introduce Snowshoes: Describe for the students why people use snowshoes- *Humans have the ability to use tools like snowshoes to help them travel in harsh weather. Snowshoes help people stay afloat and on top of the snow. With snowshoes people sink in the deep soft snow, this makes walking much more difficult.* You can help the students experience this phenomenon by first walking out in the deep snow without snowshoes. Then after a minute or two, put on the snowshoes with the students. *What is the difference? Did they help you stay afloat?* Afterwards have the students draw pictures in the classroom of the snowshoes to explain how they work.

Curriculum Connection:

NGSS (K-ESS3-2): Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.

NGSS (K-2-ETS1-2): Engineering Design- Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

NGSS (1-LS1-1) Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

Snow Crystal Cards

Evoke a sense of wonder in your students through observing snow-crystals!

How to do it:

This activity works well during times when there is falling or freshly fallen snow. The basic premise is to wait until it is snowing and then produce a bag of pictures/hand-lenses. The pictures should each illustrate a different type of snow crystal. Laminate the cards to protect them from the snow. Attach a hand lens to each card for making closer observations. Tell the kids they need a partner. Start handing out the beautiful snow-crystal cards with the hand lenses attached. With their partner the students can use the hand lenses and look at the shapes of the snow-crystals falling from the sky and piling up on the ground. Encourage the kids to find as many as they can and call out the crystal types as they find them.

Timing: Anytime it is snowing

Duration: 10-15 minutes

Materials: Pre-made (laminated) crystal cards with hand lenses attached

Curriculum Connection:

National Science Education Standards (Earth Science) - Students should develop an understanding of changes in earth and sky

Animal Ambulation

Let your SnowSchool students explore their inner animals!

How to do it:

Start your day with this one to really warm the kids up and get them excited about winter wildlife. Tell them they are going to be learning about forest creatures, so you want them to move like animals! You can start it off by leading them in a single file line. Yell out “Bear” and then walk on all fours while grunting like a bear (the kids then follow suit). After a while call on the kids to suggest local animals and let them demonstrate how their animal walks (everybody then follows this). The more animal acting you do initially, the more they will get into it. Be clear initially that you are looking for them to pick animals that they believe live in the forest (or wherever you are). Make sure you or one of the students calls out “snowshoe hare”. After each student gets a turn to demonstrate circle the group back up and have a quick discussion.

Ask the students these follow-up questions:

- *Did you name all the major species in this area or are there more?*
- *What animals are you most likely to see today?*
- *How will you know if animals are nearby?*
- *How are the snowshoes you are wearing helping you mimic the adaptations of the snowshoe hare?*

Curriculum Connection:

Next Generation Science Standard (1-LS1-1) Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

Snowshoe Hare Ears

Challenge your students to use their senses to make deeper observations about the natural world!

How to do it:

Imagine you are snowshoeing with a group of students when you hear a faint bird call in the distance. With all the excited chatting and crunching snowshoes, not a single student heard it! Tell the students to stop and hold their hands up. Tell them that you are going to teach them to hear almost as well as a deer does. Have them put their hands behind their ears so that they can really hear the difference with their new **Snowshoe Hare Ears**. Tell the group you want them to listen quietly to the natural environment and count the number of different sounds they hear. After you frame this listening activity you will be able to quickly return to Hare's Ears later in the day if needed. By focusing on the process of using their senses we can not only teach students' about the environment, we also show them how to enjoy and experience nature. This can lead to a great discussion about the importance of being quiet in the outdoors and respecting the tranquility of the winter landscape.

Alternate variation: Have students build snowshoe hare ears in the classroom with cardboard or other materials.

Curriculum Connection:

Next Generation Science Standards (1-PS4-4). Use tools and materials provided to design a device that uses light or sound to solve the problem of communicating over a distance.

Next Generation Science Standard (1-LS1-1) Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

Light, Ice, Water and Snow

How to do it: This is a simple activity/experiment designed to align with Next Generation Science Standards and explore the nature of light, ice, water and snow. This can be done as a snow-infused addition to an already planned experiment into the nature of light. First, create a sample(s) of ice by freezing some water in a clear plastic cup. Then go outside with the students when there is snow present and have the students collect some snow in a clear plastic cup. Back in the classroom present the students with four samples each in a clear plastic cup: a cup of ice, a cup of water, a cup of snow and an empty cup (optional). Introduce a flashlight or laser or some other instrument capable of producing a beam of light.

Make Predictions: *How will each material affect the beam of light? Does it matter that snow, ice and water are all made out of the same thing (water)?* Get a hypothesis from every student. **Run the test:** Let the light shine through each sample and have the students describe what happens. **Discuss the results.** *Why is there a difference?*

Materials: Clear plastic cups or other containers. A light.

Curriculum Connection:

Next Generation Science Standards (1-PS4-3) Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.