



SNOWSCHOOL

2nd 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.

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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. The program has been around long enough that, in some places, students have grown up and become SnowSchool educators!

SnowSchool is designed to be 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. 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 an important component of the program because SnowSchool is intended to 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.

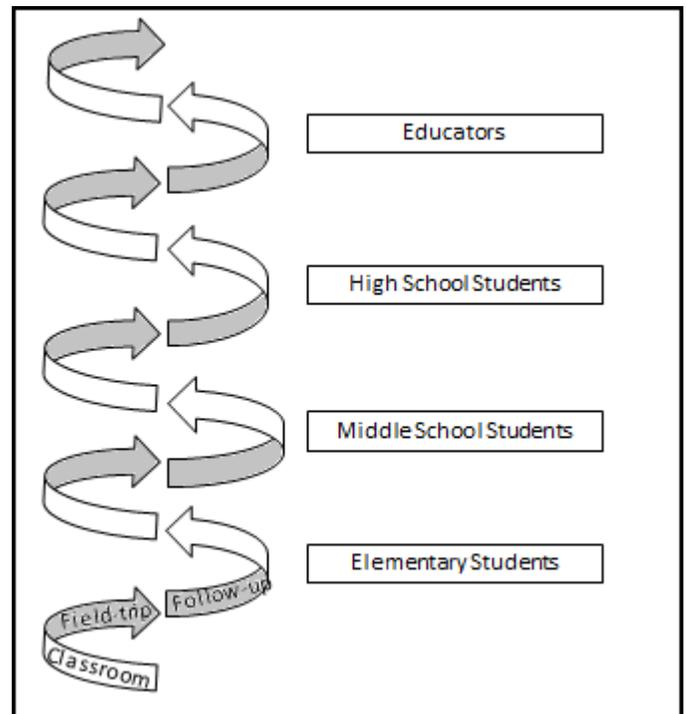


Figure 1: SnowSchool's spiraling curriculum model enables students at a variety of grades levels to explore snow science and ecology in a manner that connects classroom study, field excursions and follow-up extension projects. Eventually SnowSchool students might one-day become volunteer SnowSchool educators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

2nd Grade One-Page Curriculum Outline

Group: Classroom of students from Adams Elementary 2nd Grade

Focus: Snow Science and Winter Ecology

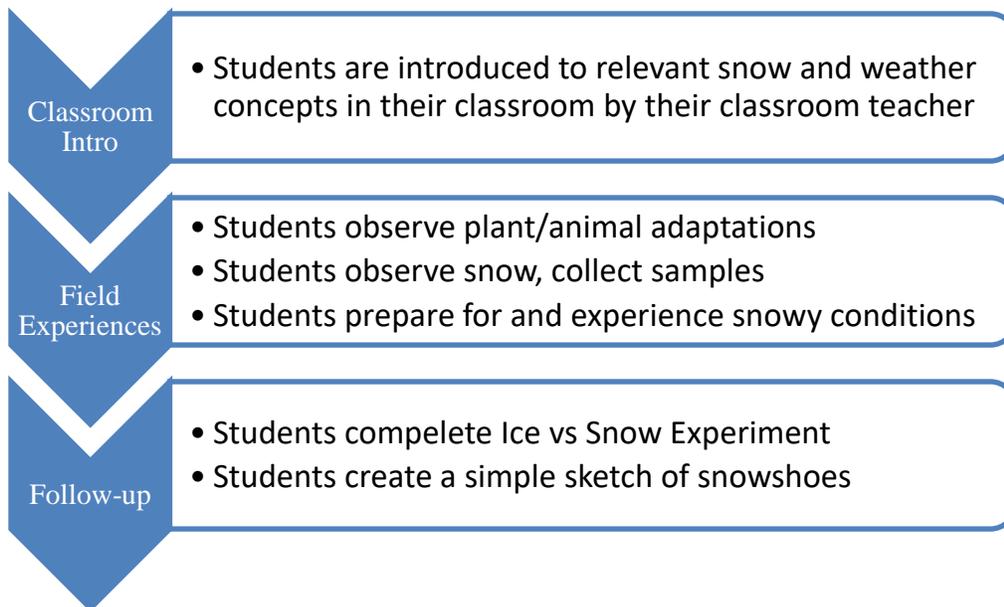
Objectives (what we want the students to learn):

- Students will learn about the basic properties of snow.
- Students will learn about the role of snow in the water cycle
- Students will learn about plants and animal winter adaptations
- 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 act-out the journey of snow/water through the water cycle
- Students will make observations to determine the effect heating/cooling on snow, ice and water
- Students will observe and describe plant/animal winter adaptations
- 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 and 1st Grade 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-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

Winter Plant Duplication

Explore plant adaptations by challenging students' observation skills!

How to do it:

This is a classic outdoor education activity but at SnowSchool sometimes the challenge in winter is finding enough plant items in all the snow. Try looking in tree wells and picking out your items ahead of time. Collect 5-8 different plant items (cones, twigs, needles, leaves, moss, etc) and make sure the kids don't see them. Cover the items with a hat or handkerchief. Consider an introduction that challenges the students' powers of observation. With the hidden items laid before them explain to the students that in a moment you will remove the handkerchief and the plant items will be revealed. The students will get 10 seconds to take in as much information as possible. After the 10 seconds are up put the handkerchief back over the plant items. The challenge is for the students to go find each item in the surrounding environment. Give the 5 minutes or so to do this. When they are finished, gather the group and dramatically remove each item one at a time from under the cloth. As they come out check with each student to see if they found the item. Share a cool fact about each plant part. This is a great time to talk about plant parts and how your native foliage adapts to the winter environment.

Timing: Anytime plant material is available

Duration: 15 minutes

Materials: handkerchief, 8 plant items

Curriculum Connection:

Next Generation Science Standards (2-LS4-1): Make observations of plants and animals to compare the diversity of life in different habitats

Snow Track Theories

Teach the students how to investigate winter wildlife mysteries!

How to do it:

Interpreting snow tracks can be intimidating for the leader because students always ask, “What is it?” Sidestep this trap- Don't try to know everything; that's impossible (and a bit boring). If you encounter some mysterious tracks in the snow, spend some time checking them out, but don't get sucked into being the “expert.” Involve students in the process of discovery! Explain that making observations is an important step of scientific investigation. Ask the students:

- Is the animal that made these tracks bigger or smaller than you?
- How many feet does it have? How many toes does it have?
- Does it have hooves, paws or something else?
- What direction is it going? How can you tell?
- If this individual had bigger feet would it increase or decrease its chances of survival in this particular habitat?

By ask the students to make closer observations you can guide them into embracing this wonderful winter mystery! After the group has made some good observations ask the kids to come up with some theories for what specific animal made the tracks. Generating theories is another important part of scientific inquiry. End the discussion by asking the kids for ideas about how to verify or test the different theories. This activity introduces the process of scientific inquiry and encourages critical and imaginative thinking. You can apply it to other natural phenomena besides tracks.

Timing: Whenever an appropriate teachable moment presents itself

Duration: 15 minutes

Materials: None

Curriculum Connection:

Next Generation Science Standards (2-LS4-1): Make observations of plants and animals to compare the diversity of life in different habitats

Snow's Incredible Journey

Take your students on a trip from mountain-top to oceans deep!

How to do it:

This is a fun activity that lets the kids act out snow's cyclical journey. As they move down through the watershed the students gain an understanding of snow and its connection to the rest of the water cycle. Read the following narrative and have students act out each instruction (as you get more familiar with the activity you can ditch the script and go from memory):

STAND WITH ARMS OUT! - For the moment you are a snowflake and part of the Snow Pack. The temperature is well below 32 degrees F and you are frozen in brittle crystal form. That means if I come by and move you around your arms should be stiff and I should hear a crackling noise.

SQUEEZE YOURSELVES TOGETHER! - As more snowflakes fall through winter months you begin to notice their collective weight bearing down on you. Weight and fluctuating temperatures begin to morph and compress your crystal form until you are packed tightly together, huddled near the bottom of the snow pack.

THE SUN COMES OUT! (hold up sun card) One spring day you begin to melt. Now that the temperatures are above 32 degrees F you are a full blown liquid.

ROLL DOWN THE MOUNTAIN! - In this fluid form you begin to roll right down the mountain side. You are now runoff. Slowly at first and then faster you tumble over rocks and logs as you journey towards the valley below.

STOP! JOIN HANDS! - You have entered a large river, join hands and follow the flow of river! (Adult must lead.) Along the way you give a home to the fish and other aquatic wildlife and provide drinking water, irrigation and hydroelectric power for the people who live around you. Say Hello to the Fish! Say Hello to the Otter! Say Hello to the People!

MAKE A CIRCLE! - The river has finally flowed into the Pacific Ocean! Here you meet up with 97.2 of all other water molecules in the world. High-Five every single water molecule in the ocean. If this were the real ocean, imagine how long it would take to high-five every single water molecule! How long do you think it would take?

THE SUN COMES OUT! - (hold up sun card) This time you are heated up so much that you change from a liquid to a gas. That's right, you have just been EVAPORATED!

RUN UPHILL BACK TOWARDS THE STARTING SPOT- Water vapor soars quickly into the atmosphere.

CLUSTER TOGETHER AND REST! - At a certain altitude the temperature begins to drop which causes CONDENSATION. Condensing together in liquid form in the sky the group has become what humans commonly call a cloud. Strong winds to your back blow you towards a large mountain range in the distance. When your cloud hits the mountains you are lifted and carried higher into the atmosphere. Here the temperatures are very cold causing you to freeze and your cloud to PRECIPITATE. This means you are snowflakes again and you must re-assume your crystal form and drop out of the sky.

Find a good spot to DROP OUT OF THE SKY (aka jump into some deep powder) and re-join the snow- pack. (Note: only "drop out of the sky" if snow condition are soft and fluffy enough)

Duration: 5-10 minutes

Materials: Printed Script, Sun Card

Curriculum Connection:

Next Generation Science Standards (2-ESS2-3): Obtain information to identify where water is found on Earth and that it can be solid or liquid

Snowflake Scramble

Warm up the students by turning them into snowflakes!

How to do it:

This is a high energy game that will have the students running around and acting out the various forms of snow. It is a great way to introduce the concepts of snow crystal shapes, changes in states of matter, sun affected snow, and how avalanches move. Before starting the game have the students circle up and introduce them the various snow forms. The various forms are as follows:

- Fresh Snow: Run around drifting “from the sky” with arms stretched out
- Stellar Dendrite: Grab a partner, stand feet spread apart one in front of the other partner (back to front); one partner puts arms in a Y, other partner puts arms up in a T
- Plate: Groups of 3 make a hexagon by hold their hands together circle-like
- Needles: Each kid stands with arms held straight up over their head
- Sun Crust: Each kid melts (wiggles) then lies in the snow frozen in place
- Avalanche: Everyone runs downhill

Start the game off with Fresh Snow (kids running around). Call out a specific shape/form. The kids are out if they forget the action, are too slow, or are unable to find the proper number of partners. Students cannot change from one form to another without being “thawed” first into Fresh Snow. You must call out Fresh Snow/ Thaw between each form. Like the game “Simon Says” if students move when they are not first “thawed” they are out (you can get a lot of students out if you are sneaky with this rule). Play until there are one or two winners.

Timing: Anytime you need to warm your students up!

Duration: 15-20 minutes

Materials: None, (but snow crystal visuals can be helpful)

Curriculum Connection:

Next Generation Science Standards (2-ESS2-3): Obtain information to identify where water is found on Earth and that it can be solid or liquid

Ice vs Snow Experiment

How to do it: This is a simple activity designed to align with Next Generation Science Standards and explore the nature of snow, water and ice. This may work well as a complementary activity to an already planned investigation of physical changes caused by heating and cooling. First, create a sample(s) of ice by freezing some water in a clear plastic container. Then go outside with the students when there is snow present. Have the students collect some snow in a clear plastic cup/container.

Present the samples of snow and ice to the students. **Ask questions:** *What will happen when we heat up these samples? After we heat them up, what will happen when we cool them down?* Get predictions from every student. **Run the test:** Let the sun shine on the samples for a couple hours and observe what happens. Put them in the freezer and observe what happens. **Discuss the results.** *What happened to the snow? How is snow made? Why are some changes caused by heating/cooling reversible and other are not?* Discuss with the students what other materials are affected by heating/cooling in this way.

Materials: Clear plastic cups or other containers. Snow, water/ice, sun/heat, freezer.

Curriculum Connection:

Next Generation Science Standards (2-PS1-4) Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.