Learner Objectives:

- Learners will be adequately prepared with proper clothing and equipment for the day's activities.
- Learners will discuss the history of snowshoes and identify animals with similar adaptations.

Lesson Goals:

- Learners will understand and feel comfortable with the proper use snowshoes.
- Learners will understand how snowshoes work and be able to identify animals with similar adaptations.

Materials:

- Additional warm and/or waterproof clothing for students if nedded
- Snowshoes (one pair for each student)

Lesson 1
Small Group Introduction and Snowshoe Orientation

Background Information:

Middle and high school students will be traveling from all over Whatcom and Skagit Counties to participate in SnowSchool (elev. 3500') at the Mt. Baker Ski area. Despite living in such close proximity, many of these students have never been to this specific location in the North Cascades. SnowSchool instructors will be responsible to ensure their group of students are adequately prepared and comfortable for the day's activities. All instructors are expected to be outside to greet the students when the bus arrives. The coordinator or another designated instructor will board the bus and welcome students to SnowSchool. Instructors will be asked one by one by the coordinator to step onto the bus, introduce themselves and lead their students off the bus towards the lodge where they will ensure everyone is prepared for the day's activities.

Orientation Activity:

1) Welcome students to SnowSchool at the Mt. Baker Ski Area. Introduce self and ask students for their names (any number of name games can be played if it is helpful and appropriate for instructor to know students). Additionally, ask students:
    a. Are there any observations you'd like to share about your trip up to SnowSchool?

    b. Have any of you been up to this area before? If yes, what time of year was it and what were you doing? Did it look different than it looks today?

2) Walk students to the lodge and direct them to the restrooms if they need to use them. Afterwords, ask students if they are prepared to be outside in the weather for a few hours. Ensure students are properly dressed with warm layers and waterproof shells. Find out if any students needs to borrow clothing or boots for the day. Lead the group throught the process of checking out equiptment as quickly as possible.

3) Take students to the snowshoe station and ask if any of them have used snowshoes. If appropriate, have a student demonstrate to the group how to properly put them. Assist students as necessary. Encourage them to practice walking around, falling and getting up.

4) As students finish securing snowshoes, introduce *Snowshoe Rock, Paper, Scissors*. This is a great way for them to warm up and check that all snowshoe bindings are securely fastened. Here is how to play:

    a. Pairs of students face each other and hop while they call out "rock-paper-scissors – SHOOT!".

    b. On "SHOOT!" the students arrange their feet in either rock, paper or scissors (rock = feet together, paper = feet apart (spread eagle style), scissors = 1 foot forward, 1 foot back (splits style)).

Assessment:

- Check to ensure students are properly clothed to safely participate in the day's activities.
- Students will demonstrate through activity that snowshoes are properly fitted and secured.
- Additional assessment is embedded in the conversations as they progress. Inquiry-based teaching techniques are recommended. Questions posed to the group regarding snowshoe history and animal adaptations will lead to answers and discussions the educator can use to assess student connection and content understandings.

Time Frame:

- 20-30 minutes

c. The winner is declared per usual rock, paper scissors rules (rock beats scissors, scissors beats paper, paper beats rock).

If time permits, play a few of rounds to get students warmed up.

5) When the group is ready to head out on the trail, ask students questions regarding the use and history of snowshoes. Use inquiry-based learning techniques to engage the students. Questions may include:

   a. Where do you all think snowshoes came from? How long have snowshoes been around?
      i. *Snowshoes have been used by humans for more than 4,000 years. There is evidence of snowshoes used in North America, Europe and Asia. Indigenous peoples across North America traditionally used them for winter travel and hunting in the snow.*
      ii. *Some of the longest snowshoes were made by the Cree people of the area that is now Eastern Canada. They were up to 6 feet long!*
      iii. *The basic snowshoe design has not changed much over time. Some alterations include adding a cleated bottom and hinged binding, and replaced the wood frame for an aluminum one. Snowshoes are an example of applied science. Today we will use this indigenous-based applied science to explore and learn in this winter ecosystem.*

   b. Why do we use snowshoes? Can you think of any animals that have similar adaptations to snowshoes?
      i. *We use snowshoes to stay on top of the snow (snowshoes provide more surface area to distribute our weight). How would a deer compare to a bobcat when traveling on soft snow?*
      ii. *Examples of animals with adaptations for walking on the snow may include bobcats, snowshoe hares, wolverines and polar bears, all of which have relatively large feet compared to their body size.*

Learner Objectives:

- Learners will locate and orient themselves in the Nooksack River watershed using a map and compass.
- Learners will collectively create a model of the Nooksack River watershed using compact snow.
- Learners will explore through their model how different physical and weather characteristics affect the watershed and its snowpack.
- Learners will hypothesize how climate change may affect the Nooksack River watershed.

Lesson Goals:

- Learners will understand where they are in relation to the Nooksack River watershed.
- Learners will understand what a watershed is and how it collects water, stores snow and flows from source to mouth.
- Learners will understand how physical and weather characteristics affect the watershed and its snowpack.
- Learners will understand how climate change will affect the Nooksack River watershed.

Lesson 2
Nooksack Watershed Orientation

Background Information:

The Nooksack River watershed encompasses approximately 825 square miles of diverse landscape in northwest Washington and southwest Canada. The Nooksack River begins as a trickle at the East Nooksack Glacier. These headwaters are located in the glacial-carved valley known as the Nooksack Cirque (elev. 3,620'), situated on the eastern side of Mt. Shuksan. The Nooksack River travels approximately 75 miles, where it empties into Bellinhgam Bay in the Salish Sea. During the journey from the Nooksack Cirque to Bellingham Bay, this unique river collects large amounts of water from its 825 square miles of landscape contained in its watershed. Students will explore and orient themselves to the upper reaches of the Nooksack watershed through map and compass, building a model of the watershed and a discussion regarding climate change.

Map Orientation Activity:

1) Pull out the topographic map and compass. Ask for student volunteers to place the map on the ground so everyone can see it, and orient it using the compass. Assist as necessary.

2) Ask student to complete the following, assisting as necessary:
    a. Identify and trace the highway they traveled up to get to snow school.
        i. *Hwy 542*
    b. Identify the river the highway follows.
        i. *Nooksack River*
    c. Locate their current location on the map.
        i. *White Salmon Lodge, Mt. Baker Ski Area*
    d. Determine the elevation of their current location.
        i. *3500 feet*
    e. Locate nearby mountains on map and by sight (if visibility permits).

3) Ask students to identify boundaries they see labeled on the map. These may include:
    a. *US/Canada border*
    b. *Mt. Baker Snoqualmie National Forest boundary*
    c. *North Cascades National Park boundary.*

    Ask students if there are other boundaries not represented on this map. Answers may include:
    a. *Native American traditional territory*
    b. *Private property*
    c. *Or even animal territories!*

Watershed Activity:

1) With the map still oriented on the ground, begin this next activity with the following question:
    a. What is a watershed?
        i. *A watershed is an area of land that collects all the runoff and feeds it into a larger body of water. A network of streams,*

Materials:

- *14 Mt. Shuksan* Green Trails topographic map
- Compass
- *Elevation Zones and Orographic Effect in the Pacific Northwest* handout

Assessment:

- Assessment is embedded in the activity as it progresses. Inquiry-based teaching techniques are recommended. Questions posed to the group will lead to answers and discussions the educator can use to assess student connection and content understandings.

Time Frame:

- 20-30 minutes

creeks and rivers progressively drain into larger bodies of water. Topography determines where and how water flows. Ridge tops surrounding a bodies of water often determine the boundary of a watershed.

2) Gather students in a circle and use the snow to create a model of the Nooksack watershed. Compact the snow to build mountains, ridges and other features of the Nooksack watershed. Encourage students to include features like Mt. Shuksan, Mt. Baker, the Nooksack Cirque, the Nooksack River and Bellingham Bay. Suggest the students use the map to help create and orient the watershed. Once the model is complete, ask students to:
    a. Demonstrate where water flows when it rains in certain areas of the watershed.

    b. Trace the path snow melt will take as it melts during the spring and summer months from different mountains and ridges.

3) Use the *Elevation Zones and Orographic Effect in the Pacific Northwest* laminated handout in your instructor kit to emphasize and inquire about the following characteristics in the context of the watershed model:
    a. Elevation – How does elevation affect snow or rain accumulation?

    b. Treeline - What elevation is the treeline generally found at in the North Cascades? Do trees affect snow accumulation? Do you think trees affect snow's relationship with wind?

    c. Aspect - Are there aspects that receive less direct sunlight during the day? How about more? Does this have an effect on the snowpack and snow melt? Which aspect is the beginning of the Nooksack watershed facing (the Nooksack Cirque)?

    d. Freezing level - Can we look around and determine visually where the freezing level is?

    e. Orographic Effect (ask students if they are familiar, and if not, provide a definition) - How does the orographic effect influence this particular watershed?

Climate Change Discussion

1) Begin a discussion about climate change with your students either at the watershed model or as you are moving on the trail to your next destination. Tell the students:
    a. Scientists believe climate change will have significant impacts on our (the Nooksack) watershed. There are several different predictions of snowpack levels for the future. Although scientists' predictions differ on how much the snowpack will decline, there is little doubt that it will decline.
2) Ask students to think about and respond to the following questions:
    a. Based on your understanding of how snow accumulates in the mountains and in this watershed in particular, will climate change decrease the amount of snow in the mountains? Why? Answers may include:

Key Terms:

- **Cirque**: A large, carved-out valley created by glacial erosion.
- **Nooksack Cirque**: The glacial-carved valley (elev. 3,620') situated on the eastern side of Mt. Shuksan. The Nooksack River headwaters originate here.
- **Mt Shuksan**: A 9131' mountain in the North Cascades. Snow school takes place at 3500' on the Shuksan Arm and has a view of the NW face of Mt. Shuksan.
- **Topographic Map**: A map representing the elevation of physical features through contour lines.
- **Watershed**: A watershed is an area of land that collects all the runoff and feeds it into a larger body of water.
- **Treeline**: The upper limit of trees, approximately 6000' in the North Cascades.
- **Timberline**: The upper limits of continuous cover of upright trees.
- **Aspect**: The direction (N, S, E, W) an object or specific feature faces.
- **Orographic Effect**: As a warm air mass from the Pacific Ocean moves onto land, it gains elevation as it follows over the rising terrain. As the air mass gains altitude to pass over the mountains, it quickly cools down, condenses into clouds and sometimes precipitates.
- **Climate Change**: The long-term change in weather patterns.

   i. *Warmer temperatures will raise the freezing level, therefore snow will fall as rain.*
   ii. *Warmer temperatures will shorten the winter months.*
   iii. *Warmer temperatures will melt off snow earlier in the spring instead of the summer.*

b. What impact will this have on our watershed and our communities? Answers may include:
   i. *Decrease in water for farmers in the summer*
   ii. *Decrease in water for spawning salmon*
   iii. *Increase in forest fires*

c. What are some ways we can adapt our way of life to deal with a smaller mountain snowpack? Answers will vary.

Learner Objectives:

- Learners will identify, measure, and record characteristics of weather, plant life, and animal life.
- Learners will discuss how weather affects snowpack.
- Learners will discuss plant and animal adaptions in the upper reaches of the Nooksack watershed.
- Learners will hypothesize how climate change may affect the Nooksack River watershed and its inhabitants.

Lesson Goals:

- Learners will understand how to take and record accurate measurements of weather observations.
- Learners will understand specific plant and animal adaptions allowing for their survival in the Nooksack River watershed and its snowpack.
- Learners will understand how weather characteristics affect snowpack.
- Learners will understand how climate change will affect the Nooksack River watershed and the plants and animals living there.

Lesson 3
Environmental Observations

Background Information:

Northwest mountain weather greatly affects the Nooksack River watershed and the North Cascades ecosystem as a whole. Largely characterized by heavy precipitation in the form of snow, the upper reaches of the Nooksack watershed offer a unique ecosystem to study weather, snowpack and plant and animal adaptations in relation to the watershed. Students will first explore and measure different ways of observing weather characteristics. They will then work in pairs to explore and share the different plants and animals living in this unique, snow-filled ecosystem. They will discuss adaptations necessary for this and brainstorm how the ecosystem might be affected if the predicted change in climate decreases snowpack in the future.

Weather Observations Activity:

1) Begin a discussion by asking students about what they notice about the weather in their home town and the weather at Snow School in the mountains. Questions may include but are not limited to:
    a. What was the weather like when you boarded the bus at your school this morning? Rain? Snow? Sun? Warm? Cold?

    b. What is the weather like up here at snow school?

    c. What is the elevation where you are from (*instructors should look this up prior to students arrival*)? What is the elevation at Snow School (*3500'*)?

    d. What do you think affects the difference in observations? Could it be related to elevation? Why or why not? What is the evidence for your conclusion?

    Encourage students to notice the differences in weather between locations. Use elevation as a component to discuss some of the difference. If necessary, guide the conversation to encourage students in making connections between the current weather and the effect it has on the snowpack. Keep this in mind as you ask the students to make some weather observations with tools you will provide.

2) Inform the students they will be making weather observations. If appropriate, encourage them to record their data in the *Environmental Observations* page of the Snow School field journals. From your instructor kit, pass out the thermometer, the *Beaufort Scale Chart* handout and the compass. Tell the students these are some of the tools used by field scientists to collect data. Ask students if they know how to use any of these instruments. If yes, ask students to demonstrate how to use them to the rest of the group. Students can work individually or collectively to gather observations. The following observations are recommended:
    a. Temperature – Have students use the thermometer to gauge the temperature. Ask them: How does temperature affect the kind of snow we have? How does it affect the snow on the ground (the snowpack)? How does temperature affect the type of snow that is falling?

Materials:

- Snow School field journal (optional)
- Thermometer
- Compass
- *Beaufort Scale Chart* handout
- *Snow School's Common Species* handout

Time Frame:

- 20-30 minutes

Assessment:

- Assessment is embedded in the activity as it progresses. Inquiry-based teaching techniques are recommended. Questions posed to the group will lead to answers and discussions the educator can use to assess student connection and content understandings.

b. Precipitation – Have students observe the precipitation. Ask them: What is falling? Rain? Snow? Slush? Is it a heavy or light amount? What is the quality of the precipitation? Is this affected by temperature? Why or why not?

c. Wind – Instruct students to use the *Beaufort Scale Chart* handout to determine the speed of the wind (students can record in numerical scale or description). Ask students: What is the wind speed? Is it constant or intermittent? What direction is it coming from (use compass to determine)? How might this affect snowpack?

a. Aspect – Have students use the compass to determine what aspect their location is facing (N, S, E, W). Does this have an effect on any of the previous observations? Does it affect the snowpack? Why or why not?

If students worked independently, encourage them to share with each other and compare data. Suggest they discuss any similarities and discrepancies in data they gathered and explore how these occurred or what it might reveal.

Plant and Animal Life Activity

1) This activity can be done individually, as a group or in pairs. Pairing is recommended in these observations, followed by sharing back with the larger trail group through discussion. Ask student pairs:
    a. Do you think the environment you are exploring up here at Snow School is a habitat abundant with life? Why or why not? Have you observed any plant or animal life while up here?

    b. What could we look for to help determine what might be living in this habitat? Answers may include:
        i. *Animal tracks, tree cones and needles in the snow, lichen in the snow, pink snow from algae, animal feces, bird calls and sounds.*

Encourage students to identify any plants, animals or signs of they observe. Inform students that this habitat is in fact abundant with life. Ask students:

a. Even if we don't see signs of some species, what do you think might live up here? Answers may include:
    i. Douglas Fir, Mountain Hemlock, Lichen, Huckleberry, Raven, Gray Jay, Black Bear, Snowshoe Hare, Mice, Wolverine, Deer, Bobcat.

b. What are some of the adaptations we might see in plants and animals in this environment and why? Answers may include:
    i. Shortened tree height (protect from wind and snow loads), thicker fir, camouflaged fir, broad feet (for snow travel), narrow hooves (for digging for food underneath snow), snow burrows.

Encourage students to record any of their insights or observations in their Snow School field journal on the Environmental Observations page. If time permits, pass out the Snow School's Common Species laminated handout. Challenge students to identify these species on the handout during their explorations at Snow School.

Key Terms:

- **Field Location**: Snow School is located approximately 60 miles from Bellingham Bay at 3500' of elevation.
- **Aspect**: The direction (N, S, E, W) an object or specific feature faces.
- **Watershed**: A watershed is an area of land that collects all the runoff and feeds it into a larger body of water.
- **Nooksack Cirque**: The glacial-carved valley (elev. 3,620') situated on the eastern side of Mt. Shuksan. The Nooksack River headwaters originate here.
- **Climate Change**: The long-term change in weather patterns.

Begin a final discussion with students about how scientists believe climate change will have significant impacts on our (the Nooksack) watershed. There are several different predictions of snowpack levels for the future. Although scientists' predictions differ on how much the snowpack will decline, there is little doubt that it will decline. Ask students:

a. How will a decrease in snowpack affect plants and animals who have adapted to live up here? How will it affect humans? How will it affect plants, animals and humans down river?

Learner Objectives:

- Participate in kinesthetic activity to visualize the different formations of snow crystals based on temperature.
- Explore snow crystals with magnifying loupes and share their observations.

Lesson Goals:

- Understand how snow crystals form and what environmental factors influence crystal morphology
- Make connections between the microcosm of crystals and the larger snowpack and what that means for snow density and water content.

Materials:

- Magnifying loupes
- Snow Card
- *Temperature vs. Supersaturation Snow Crystal* Diagram
- SnowSchool journals (optional)

Lesson 3
Snow Crystal Morphology

Background Information:

Snow crystals form when a tiny speck of material in the atmosphere becomes very cold, followed by water vapor adhering to it. The speck of materials can be ash, salt, pollen, soil, dust or even bacteria. The water vapor that freezes to this particulate forms a hexagonal plate with 6 branches as it makes its way down to the ground. The shape of the crystal depends on the humidity and temperature in the atmosphere (as seen in the snow crystal diagram). Snow crystals are not only different in their formation, but also different as they have settled throughout various depths of the snowpack. They change as they become buried in the snowpack by more recent snow fall. The buried snow crystals are affected by water vapor molecules flowing through the snowpack, attaching to or detaching from these snow crystals. Snowflakes also change due to mechanical damage or to the pressure within the snowpack they experience.

Snow Crystal Formation Activity:

1) Introduce the concept of a snow crystal. Ask students:
    a. Describe what you imagine a snowflake looks like? How many sides?

Ask them to think about the classic paper cut-out snowflakes some of them may have made before. Tell them that real snow crystals actually look very similar to this. Ask students:

a. What do you think happens to a snowflake once it lands on the ground?

b. Do you think the snow under your feet looks like the snowflakes that fall out of the sky?

Encourage students to dig down where they are standing to compare different snow. Suggest students hypothesize why snow crystals they find may or may not look different.

2) Invite students to stand in one large circle (At least seven participants are needed for this activity. If a single group is not large enough, see if another trail group will join for this activity.).
    a. **Form a hexagonal snow crystal**: Ask a student to volunteer as the dust, bacteria, or algae particulate. Instruct them to stand in the center of the circle. Tell the students this particulate is floating way up in the atmosphere and is beginning to get very cold. As the temperature drops, invite six participants to become frozen water molecules, and reach out and attach one of their arms to the center particulate. A hexagonal snow crystal has now formed! Any additional participants and attach to the students who represent the water molecules, extending the crystals in size.

    b. **Change into a rounded snow grain**: One at a time, have any students attached to the original six water molecules detach from the arm and reattach to the center dust particle. Keep doing this until the group has a rounded figure instead of a star-shaped one. Point out that rounded

Assessment:

- Students will demonstrate participation through sharing their crystal observations.
- Additional assessment is embedded in the conversations as they progress through the activity and the day. Inquiry-based teaching techniques are recommended. Questions posed to the group regarding crystal formation, weather, and snowpack will lead to answers and further discussions the educator can use to assess student connection and content understandings.

Time Frame:

- 20-30 minutes

snow grains stick together very well! Rounded grains form by destructive processes. Water vapor molecules break off and reattach toward the center of the crystal. These usually form when temperature is warmer and even throughout the snowpack or throughout a specific layer in the snowpack.

c. **Change into an angular snow grain:** Start over with your original dust particulate and one group of three to six students attached as the crystal's arms. Encourage additional students (as water vapor molecules) to attach themselves in all different, chaotic directions. The crystal will become more angular and irregular the more people (water vapor molecules) are added. Point out that angular snow grains do not stick together very well at all! Angular grains form by constructive processes that usually coincide with colder temperatures. The crystals are generally poorly bonded, weak and unconsolidated.

d. **Create melt-freeze situation:** Ask students to form two different snowflakes with 4-7 students each. Have any leftover students "flow" between the two snowflakes (as melted liquid water), attaching the two snowflakes together. Point out that melt-freeze can occur anywhere in the snow pack, but often occurs near the top where the snow is warmed by the sun. Melt-freeze strengthens the snowpack by cementing grains together and forming well-bonded layers.

Snow Crystal Observations Activity

1) Share with your students the *Temperature vs. Supersaturation Snow Crystal* diagram from your instructor kit. This visual to highlights differences in snow crystals based on temperature and humidity. As you pass out the diagram for all to see, have students predict what shape they will observe in snow crystals from the surface of the snowpack. Encourage them to think about some of the weather observations they have made and how it will influence what they discover.
    a. Pull out the *snow cards* from your instructor kit. Ask a student to demonstrate how to use one of these *snow cards* to delicately gather a thin layer of surface snow from the side of the trail.

    b. Pass out the *magnifying loupes* to students. Invite them to place the *magnifying loupe* on top of the snow crystals. Warn them to be careful not to breathe on the sample, as it will quickly morph and melt! Encourage students to make observations and then pass along the instruments so all students can participate.

2) Ask students to share their observations. Possible options for sharing include:
    a. Pair Share: Students can partner up and verbally share their observations with each other.

    b. Draw: For individual exploration, use the blank spaces in the SnowSchool journal for students to draw an up-close perspective of their crystals. Give them the option to share to the group or in pairs afterwards.

Key Terms:

- **Atmospheric Particulate Matter**: Microscopic solid or liquid matter suspended in the Earth's atmosphere. Solid particulates form the nucleus, or center structure, of snow crystal and water droplets.
- **Hexagon**: A six sided figure. Snow crystals form in this shape.
- **Humidity**: The amount of water vapor in the air.

c. Physical Representation: Task the students to work all together to make the shape of the crystals they see with their bodies, similarly to the primer activity. This can be fun and goofy!

3) Check for understanding and further the students' critical thinking. Ask students:
    a. What do the observations we made about snow crystals tell us about the temperature and humidity (*moisture in the air*) right now?

    b. Where does the heat come from when the snowpack is warm? Answers may include:
        i. *Snowpack can be warmed by the earth from below! The earth's core of molten rock causes the earth to radiate some heat, which warms the ground.*
        ii. *Snow is also warmed by direct sunlight from the top of the snowpack.*

There are many ways to connect each mini lesson/station to the other lessons and to the broader watershed concept. Each student comes to the program with a variety of unique experiences. The instructor's role is to use students' interests, knowledge and curiosity (along with your creativity!) to help guide them through the core concepts of Snow School.

Referring back to the two characteristics of snow that we introduce in the pre-trip visit, quantity and quality, is one way to thread all the mini-lessons together. Below are some questions to help you guide your towards larger concepts.

Snow Algae

Quantity

How does amount of snow impact snow algae populations? What would happen if there wasn't a very deep snow pack?

Snow algae move to the surface of the snowpack (using their flagella) in order to reproduce and photosynthesize.

How does the concentration of snow algae impact the amount of snow?

When there is a higher concentration of snow algae on the surface, the albedo effect increases, thereby melting snow faster, which results in a positive feedback loop...This can be related to the larger concept of glacial melt worldwide, and the resulting larger scale albedo effect.

How will melting snow fast impact the local watershed?

Spring flooding, disruption of nutrient flow to marine ecosystems

Quality

In what way does the quality (water content, crystal type) of snowpack affect snow algae?

Snow algae need a high concentration of water to move through the snowpack.

How might a high concentration of snow algae impact the water quality in the watershed?

Disruption of nutrient flow.....possibility of algal bloom in Bellingham Bay and impacts on higher trophic levels.

Communities of snow algae and bacteria are food source for other organisms what role does snow algae play in the larger food web?

Snow algae are a food source for ice worms, ice worms are a food source for birds

Snow Profile

Quantity

What is the depth of the snow currently? What can we infer about our spring run-off?

The North Cascades receives an average of 650"-700" of snow per winter. Our snowpack is what gets us through the dryer summer months. Other factors include the average temperature in the spring and summer.

Each layer of snow interacts with other layers to form a snow profile. What information can we gather from the snow profile? How does this snow profile inform us about the past? What about the future?
The atmospheric conditions as snow is falling is only part of the story. Once the snow is on the ground, it continually changes until the snow pack is one completely consolidated layer (isothermal: the snow pack is the same temperature the whole way through).

Quality
What is the snow-water equivalency and why is it important?
A higher water content equals a higher yield of water for every inch of snow. Predicting how much water we will see in our rivers is an important part of determining the health of our watershed.

Where is the snow?
The characteristics of our terrain has broad impacts on the way in which our snow melts. The Nooksack Cirque is generally north facing, which means that it will hold snow later in the year. This is particularly significant as it is the headwaters of the Nooksack watershed.

How do the layers interact with each other?
When avalanche experts look at profiles, they consider all how all the layers interact with each other to make predictions for how the snowpack as a whole will act under certain types of conditions (triggers, sun, more snow, ice, etc) Not only will these profiles help forecast for avalanches, but they can give us an idea of past trends in our weather and help make predictions for the future.

Environmental Observations
All of these observations directly relate to quality and quantity of snowpack, and the concept of watershed health. Please refer to the Environmental observation lesson plan for more details on temperature, precipitation, wind, aspect.

Plant, animal, human communities are all directly impacted by the quality and quantity of our snowpack. Try using the bank account metaphor as a way to connect to the students' daily life.