Snowshoeing Investigation

Grade: 4th **Season**: Winter **Time**: 3 hours
Group Size: 1 class **Ratio**: 1 adult: 5 students

Please Note: *PWLC staff leads the AM portion of this lesson the first time the teacher visits. During subsequent winter visits, the teacher leads the AM portion. A winter in-service for this lesson is available but not required. Please check the PWLC web site for details or call the office at 218-998-4480.*

For the Teacher:

Overview	In the morning, students investigate the design and use of snowshoes and practice using them outside. After lunch, students then use snowshoes to explore winter ecology on the prairie. Inside, they compare their predictions with what they discovered about snowshoes and share what they observed on the prairie during the discovery hike.
Subjects Covered	Science, Math, Physical Education
MN Academic Standards Supported	Helps support 16 standards. See section "Minnesota Academic Standards in Science" and " Minnesota Academic Standards in Language Arts."
Skills Used	Comparing and contrasting, measuring, observing, listening, following directions, predicting, asking and answering questions, discovering, recording data, exploring, balancing and coordinating
Performance Objectives	After completing this activity, students will be better able to… • Identify the features of snowshoes (cleats, decking, frame, bindings, toe hole). • Properly attach snowshoes to their winter boots. • Compare and contrast walking through snow with and without snowshoes. • Explain how snowshoes make traveling in snow easier (increased surface area) • Practice effective use of snowshoes by walking uphill, downhill, and turning around • Enjoy exploring outside in winter
Vocabulary	terrain, traction, pressure, surface area, force, fatigue, design, winter ecology, frame, lacing, decking, heel bar, toe hole, toe bar

For the PWLC Instructor:

PWLC Theme	The Prairie Pothole Region
Primary EE Message	The prairie pothole region is valuable and in need of restoration and protection.
Sub-message	Habitat: The prairie pothole region is a unique and rare ecosystem.
PWLC EE Objective	Use scientific methodology to explore the environment (ask questions, hypothesize, collect data, analyze data, form conclusions, make recommendations)
Materials	Class set of snowshoes, class set of rulers, four flagged stakes, examples of different snowshoe designs, two ice augers, wind meter, class set of thermometers and wind chill charts/Beaufort scales
Location	Barn, barn yard, Butterfly Hill, West Mallard Marsh, Breathe Hard Hill, Frog Pond, trails

Background Information

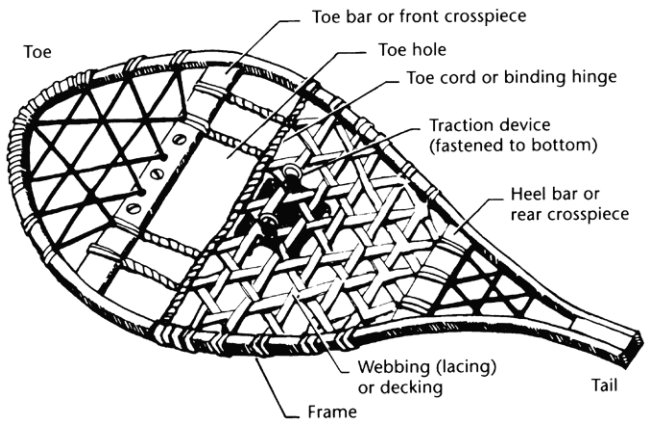
The purpose of this field investigation is to introduce basic physics concepts and engineering design and solutions through the use of snowshoes. Students also have the opportunity to experience winter on the prairie in a new way, with snowshoes

enabling a discovery hike through deep snow. (At least four inches of snow is required for snowshoeing.) They design and conduct two investigations led by their own questions about snowshoes and winter ecology. This field investigation would also make a suitable review of a science unit on engineering, adaptations, weather, winter, or seasons.

Researchers believe humans have used snowshoes for thousands of years, and snowshoes probably emerged from an older version, the "shoe-ski," from central Asia. Shoe-skis were blocks of wood with bindings to attach to the feet and aided in the migration of people further into the northern hemisphere. Eventually, the shoe-ski progressed into skis in northern Europe and Asia. In North America, the shoe-ski developed into snowshoes. Native Americans perfected the design, using materials like wood and animal leather. Although today many people enjoy snowshoeing as a recreational sport, and scientists use them to carry out research, and early settlers and Native people depended on snowshoes to survive in the winter. At the PWLC, snowshoes make exploring winter ecology practical and fun!

Familiarity with the parts of snowshoes helps students more easily learn how to attach snowshoes to their winter boots. The most important aspect is the bindings.

Parts of a Traditional Snowshoe:



Parts of a Modern Snowshoe:

Before snowshoeing outside in the morning, students practice fitting their snowshoes indoors so they will be able to put them on more quickly outdoors in the cold. Students visiting the PWLC use 8"x12" modern snowshoes during their visit called Tubbs Glacier. They are strong, lightweight, aluminum-framed, and best support boys and girls from 80 to 150 pounds in weight in fresh, fluffy powder. First, students place their snowshoes next to each other so the heel strap buckles are located on the outside. Next, they slide their first foot into the binding so the ball of their foot rests over the toe cord. Students secure their boot to the snowshoe attaching bindings over the top of the foot first and then tightening heel straps second. Repeat with the second foot, make sure all straps

are tight and secure, and they are ready to go!

Snowshoe design utilizes the basic physics relationship between pressure, surface area, and force. The force is a person's weight on the snow. The pressure applied by the person can be seen by the footprint that is left in the snow. Wearing snowshoes increases the surface area of a person's footprint; the wider the footprint, the bigger the surface area. The farther a person's weight is spread out over a larger area, the less pressure there is on the snow per unit area, and the more flotation provided. Imagine walking through grass in high heels; the heel pushes right through the ground because all of the person's weight is concentrated on a small point. Snowshoes do just the opposite. Various types of snow will also affect the flotation achieved by snowshoes. Very dry, powdery snow will not support as much weight as heavier, wetter snow. Snowshoeing at the PWLC introduces students directly to physics and engineering design through experiential learning.

The best news about snowshoeing is, if you can walk, you can snowshoe. You can enjoy it even the first time you try it. Walking should feel mostly natural, especially after a few hundred meters on flat terrain. It is also inexpensive and provides excellent cardio-vascular exercise, an active way to visit the outdoors. When you have snowshoes, there are no more excuses for not getting out and enjoying winter.

The following snowshoeing vocabulary is commonly used at the PWLC:

- **Breaking trail -** The task of the lead snowshoer stepping through the snow to make a solid path for others to follow. Breaking trail can be tiring and typically burns about 50% more calories than following the leader. Switching leaders to work as a team eases the task of breaking trail.
- **Cleat -** Traction device attached to a modern snowshoe's pivot rod to prevent slipping in steep terrain or icy conditions -- typically located under the ball of the foot and at the heel.
- **Decking -** The solid piece of rubber-like material attached to the bottom of a snowshoe frame that provides flotation for the snowshoer. A decked snowshoe can be smaller in size yet provide comparable flotation to a larger, laced one.
- **Flotation -** The amount of loft provided by a snowshoe's surface area.
- **Side stepping -** A climbing method of stepping sideways when the slope is too steep for switch backing.
- **Toe Hole -** The opening in the front of the decking that allows the forefoot to pivot through a complete range of motion.
- **Turning -** An exaggerated wide turn with the foot.
- **Webbing -** The interwoven lacing that serves as the carrying surface for traditional snowshoes, usually made of rawhide or neoprene.

It is easiest to snowshoe on flat, gentle, or rolling terrain. Steeper terrain provides a more challenging and intense hike. It helps to lift your knees higher and to walk with your feet a little farther apart to avoid stepping on one of the snowshoes. Avoid dragging your feet – step up intentionally. To travel uphill, lift those knees and dig the cleats into the snow. The fastest way to the top may be straight up, but a more practical

route is to cross the slope diagonally. To travel downhill, try to keep your weight upright and over the center of the snowshoe, and let the cleats grip the snow to prevent sliding. When traversing slopes, stay upright and lean into the hill with each step. Keep your weight forward and your crampons beneath you. Short, even strides help avoid slipping and ensure safety. When in deep snow it is important to tread lightly and pace yourself. Lift your knees and shorten your stride. The intensity level of snowshoeing is infinitely variable. From a slow walk you can increase intensity by going faster, running, using poles, going uphill, and/or by going through deeper and softer snow. The ease with which you can change the intensity level of snowshoeing is one of the keys to its great value in having fun and as a fitness option. At a minimum, snowshoeing will be a bit more intense than walking or running at any given pace or level due to the cold, weight of the snowshoes, resistance of the snow, etc. (Redfeather Snowshoes/Snowshoeing 101)

Students introduced to snowshoeing gain new insight on outdoor winter happenings because it provides them with a more efficient mode of transport. They experience first hand how basic physics principles and observation of animal adaptations can lead to human invention. With understanding and practice, they build confidence in snowshoeing as a recreational sport and can actively enjoy exploring the winter prairie. At the PWLC, we experience colder air temperatures, wind chill, frozen ponds and prairies, snowfall, and the shortest day-length (photoperiod) of the year. According to the National Weather Service, we experience the following ranges of normal conditions in winter: high temperatures of 15-25 degrees Fahrenheit; low temperatures of minus five to five degrees Fahrenheit; less than one-half to one inch of rainfall per month; and five to 15 inches of snowfall per month. Recent phenology records indicate that PWLC wetlands freeze over mid- to late November and thaw completely by the last week of March or the first week of April. The first measurable snow falls in the last two weeks of November. In winter, life on the prairie slows down considerably. Reproduction and growth are temporarily suspended, food becomes scarcer, and survival becomes the first order of business.

Animals adapt to winter in three ways. They can leave (migrate), stay and sleep or become inactive (hibernate), or they can stay and continue to be active (resisting). The animals that we find evidence of are active all winter at the prairie. The snowy world (or **nivean** environment) changes how these resisting animals live in winter. All organisms (humans included) must find food, water, shelter, and space to survive.

- Those living above the snow pack live in the **supranivean** region, including deer, foxes, coyotes, and weasels.
- Prairie chickens and rabbits submerge themselves into powder (**intranivean** or within the snowpack) for protection from predators, shelter, and warmth. Like a huge, thick blanket, a dry snow pack of at least six to 10 inches deep insulates the ground beneath it. Dry, fluffy snow provides the best insulation with more air spaces between flakes than wet, dense snow.
- In the small, narrow space between the ground and the snow pack, air temperatures stabilize at around 32 degrees Fahrenheit causing gaps to open and allowing radiant heat from the earth to thaw soil and provide abundant

moisture. This layer is called the **subnivean** layer and is inhabited by rodents like mice, shrews, and voles who graze on grass or insect eggs.
- On the surface of the **ground**, huge colonies of bacteria and fungi, eating, breathing, and growing on decaying plants, nitrogen from the soil and snow pack, and producing vast amounts of carbon dioxide.
- **Tunnels** that form along plant stems and rocks allow weasels and small rodents to pass throughout the layers.

Traveling on snowshoes, students may discover first-hand:
- Evidence of active winter animals (tracks, browse, hair, scat) or the animals themselves
- Invigorating fresh air
- Scented seed heads
- Snow depth and consistency
- Ice color and transparency
- Current weather conditions (air and snow temperatures, wind speed and direction)
- Changes over time
- And beauty, fun, and peace in the winter landscape.

Although they could read about these discoveries in a text book or observe them in a movie, there simply is no comparable substitute for experiencing them outdoors for oneself. Exploring winter in the prairie wetlands ecosystem gives students an important opportunity to become better acquainted with our home biome in every season and connects them with nature at a time of year when it's easier to stay indoors.

Teacher Preparation

- To maximize outdoor classroom time at the PWLC, teachers may
  - Lead steps one through four for the morning investigation and steps one through three for the afternoon investigation with students at school. Upon arrival at the PWLC, teachers may provide PWLC staff with a written list of what students know and wonder for quick review before starting each investigation.
  - Organize students into small groups at school, each led by one chaperone, everyone wearing nametags.
- We highly recommend conducting one or more of the suggested extensions before your visit in order to integrate this field investigation into the classroom study of animal life, winter ecology, engineering, weather, adaptations, or other topics. (See section, "Teacher-Led Extensions/Adaptations/Assessment Ideas.")
- Please help save paper. Bring your students' science notebooks or journals to record their field data and discoveries in. If science notebooks are not available, please inform the PWLC staff that you will need paper and clipboards when booking your date.

PWLC Staff Preparation

- Gather materials and select a field location in the barnyard or another open, undisturbed area with soft snow (if possible).
- Review and follow PWLC ice safety plan.

Field Investigation Procedure – AM Portion

Please Note: *The AM portion is led by the PWLC staff for the first winter visit. Teachers lead the AM portion of subsequent winter visits. A winter in-service for this lesson is available but not required. Please check the PWLC web site for details or call the office at 218-998-4480.*

1. In classroom or dining hall, welcome group to the Prairie Wetlands Learning Center. Review rules for the outdoor classroom. Split into smaller groups with one chaperone per group.
2. Explain that we will be snowshoeing in the field this morning and making discoveries about winter this afternoon while traveling on snowshoes. Ask students what it is like to walk in deep snow wearing boots (no snowshoes) Ask for a show of hands -- who has snowshoed before? Who is new to snowshoeing? Ask them to tell you what they know about snowshoeing (K in KWHL model, what do they already know?). Encourage them to take notes with you in their notebooks.
3. Ask students what they would like to discover about snowshoes this morning. Help them develop a list and write it on the board. Possible questions they may ask include, how do snowshoes work? Are there different kinds of snowshoes? What are they made of? Will they fit me?
4. Ask students to make predictions on how it will feel to walk in snowshoes. Will it be different? How? Easier? More Difficult? Good predictions include reasoning, so ask them why and write down their reasons for each prediction.
5. Set up field journals using students' questions and predictions. Include weather information, date, location, and title. Students leave their journals in the classroom, completing them upon return.
6. Show students different kinds of snowshoes on display and briefly explain their advantages and disadvantages.
7. Next, hold up a pair of student snowshoes and ask students to name the basic parts (toe holes, decking, frame, binding, cleats). Demonstrate how to attach footwear to bindings using a student's boot. First the toe goes in, then the heel strap comes up, then students tighten the straps as best they can.
8. Distribute snowshoes for students to put on inside (if very cold; outside if warmer) with chaperones helping each child in their group. Chaperones will need to make sure that the straps are tightened as much as possible. Provide adult snowshoes for chaperones to put on. Dress to go outside. PWLC staff can assist chaperones with tightening straps and lead the first students who are ready outside to record weather data, examine the snow nearby, or get in the moment.
9. Head out into the field to practice snowshoeing. Field activities may include any combination of the following at the PWLC instructor's discretion and depending on the questions being investigated and current snow conditions.
    - Lead them on a simple walk around West Mallard Marsh or to Frog Pond

and back. Bring the class to Mallard Hill, Breathe Hard Hill, or Butterfly Hill where snowshoeing techniques can be demonstrated and practiced.

i. Practice going uphill. Remind students to dig the toe of their snowshoe into the hillside for traction.
ii. Upon reaching the top of the hill, ask them the same questions as in i. above – any changes?
iii. Practice going downhill. Students should lean back slightly to prevent sliding and to maintain balance.
iv. Practice side-stepping and turning, too.
v. Also, guide students who fall down in how to stand back up.

- Stop periodically for students to check and tighten their straps.
- Collect and record weather data in the morning including wind chill.

10. Back inside, give adequate time for students to write observations, feelings, and discoveries about snowshoes. Ask them to use their journal notes to write a paragraph telling the story of what happened this morning. Allow time for reflecting and sharing together in a circle, with their neighbor or chaperone, etc. Which questions can they now answer about snowshoes from the beginning of the investigation? Discuss variables which effect snowshoeing, such as weight, snow conditions, snow depth. How do they think a difference in outdoor temperature (both warmer and colder) would affect the snow pack and the time and effort needed to travel? What conclusions can they make about snowshoeing? How would they do this investigation differently? What new questions do they have?
11. Provide a bathroom and lunch break before heading out again for a discovery hike.

Extensions for AM Portion

If time allows, field leaders may choose to lead one or both of these two additional activities:

- Walk to the pre-selected area and ask students to spread out carefully in the fresh snow. Each student should walk in a small circle and then stop to measure how deep is one of their snowshoe tracks and record their depth. If the weather is warm, each student then removes one snowshoe, walks in the circle again, measures and records the depth of one boot track. With help from chaperones, students put their snowshoes back on.
- Before going uphill the first time, ask students a few questions to focus their attention on their current comfort. Are they cold or warm? Sweaty or dry? Are they breathing normally or panting? How do their leg muscles feel?

Field Investigation Procedure – PM Portion

1. Invite students to turn to the next blank page in the field journals. Ask them to title the page “Winter Discovery” and prepare to write down notes.
2. Ask students what they already know about winter ecology? What does that mean? (the study of our home in winter) What is it like outside here in winter?

(K of the KWHL model) Give them a few minutes to write down as many things as possible on their journal page. Invite a few students to share, and write their responses on the white board.

3. Ask students what they think they might find out about winter today when exploring on snowshoes. What do they wonder about winter ecology? What questions do they have about it? Give them a few minutes to write down their questions in the journal and then share aloud again, writing on the white board.
4. Use the questions which best lend themselves to an investigation to set up the next blank page their field journal as a data collection page. Title the page "Winter Ecology," add the date, day, and location, and the weather bar. Possible quadrant titles might include snow depth, snow crystals, ice depth, wildlife, sketch, observations, wonder, surprise, mystery, etc.
5. Divide the class into two groups, each led by a PWLC employee. Within each of these two groups, further divide into smaller groups, each led by one adult chaperone.
6. Distribute needed field equipment and remind students that naturalists in the field are quiet and observant, walking in single file line.
7. Each of the two employees leads their half of the class outside and put on snowshoes near the building but in snow (inside if it is extremely cold).
8. Begin a discovery hike on snowshoes to explore students' questions about winter ecology. Each employee leads half of the class to a different area and assists their half of the class while chaperones follow through with completing activities in their small group. Students actually conduct the activities and record data. Depending upon student questions asked indoors, possible activities may include:
    - Measuring the depth of snow in different places.
    - Examining falling snow crystals, sketching, and identifying them.
    - Recording the snow and/or air temperatures in various locations.
    - Locating the coldest and the warmest places in the prairie.
    - Sketching and following animal tracks. Where do they lead? Who left them behind? How long ago? What were they doing?
    - Watching, listening to, and sketching active winter birds in the oak savanna.
    - Closely observing frost crystals on plants or the snow surface.
    - Listening to the silence and experiencing the peace of winter.
    - Collect weather data and determine wind chill.
9. Stop periodically to check for secure attachment of snowshoes.
10. Remove snowshoes near the building, and then return to the indoor classroom.
11. Match up the data recorded from the field with their original questions about winter ecology. What conclusions about winter ecology can they now draw? Give them a few minutes to write down at least one conclusion in a complete sentence, and then time to share aloud in pairs, small groups, or as a whole class. (L from the KWHL model)
12. Thank students and chaperones for coming to the prairie and encourage them to keep going outside to explore the wonders of winter in their yard or park. It's free and healthy and fun for them!

Weather Alternatives

Field investigations take place in all kinds of weather conditions. Everyone should dress appropriately for the season. In the event of unsafe weather (severe cold, high winds) everyone must come indoors. PWLC staff make every effort to make your travel worthwhile despite the weather and prepare indoor, age-appropriate plans. PWLC staff welcomes teacher input into these plans. Some possible alternatives might include:

- Go outside for a very short amount of time and practice snowshoeing around Center Pond or behind the greenhouse or barn, where buildings should provide some protection from the wind.
- If weather is too extreme, students may try on snowshoes indoors to learn how to put them on correctly and practice walking and turning around while wearing them.
- In the event that there is not enough snow depth to snowshoe, the AM portion of this lesson may be cancelled. Students will then explore winter ecology on foot in the afternoon, without snowshoes.
- Inside, split class into four or five "design teams." Provide each team with a large piece of poster paper and markers. Challenge each team to work together to design their own set of snowshoes. Start with five to 10 minutes of designing and have groups draw up blueprints. Using a variety of given materials (straws, string, wire, paper, popsicle sticks, paper clips, tape, etc.), groups must decide how to best build their design. Spend around 20 minutes to actually build a model of their snowshoe. Emphasize teamwork and especially communication and planning! For an added twist, assign each team a specific terrain that they should design for. For example, design a set of snowshoes that would be best for: thick woods, wide open prairie, steep mountain with trees, groomed trails at a state park, etc. Teams should then present their designs and finished products to the rest of the class, pointing out key features of their designs.
- Sketch different kinds of snowshoes. Using model snowshoes in the classroom, direct students to pay attention to detail and label the parts and what kind of snowshoe it is. (See section, "Background information.")
- Read Summer Coat, Winter Coat by Doe Boyle. Discuss various winter adaptations of the snowshoe hare and lynx. How might human inventions and engineering designs be inspired by animal adaptations? What are some other inventions inspired by nature? (Flippers for swimming, Camelbak water containers from camels, airplanes from birds, Velcro from burdock seeds.)
- Provide the Winter Ecology power point presentation to students.
- Make winter animal track identification entries in notebooks using latex tracks and ink pads.
- Examine furs of winter animals closely and record observations and discoveries in field journals.

Teacher-Led Extensions/Adaptations/Assessment Ideas

- Learn parts of the snowshoe by completing fill-in-the-blank snowshoe diagram. (See section "Student Materials.")

- It's easy to become warm and work up a sweat while snowshoeing. Discuss how to dress appropriately for snowshoeing, including proper layering and unique materials that help wick sweat away from your body. Check out www.winterfeelsgood.com to learn with Snowshoe Roo how to dress appropriately. Or, provide a selection of clothes (from lost and found perhaps) and ask students to select the most appropriate layers for snowshoeing, keeping in mind the qualities of different materials (wool or fleece vs. cotton, synthetics like polyester, waterproof, "breathable," etc.).
- Demonstrate physics principles using snowshoes. Investigate the relationship between weight (or force), surface area, and pressure. Pressure equals weight divided by surface area. If you increase the surface area, does the pressure increase or decrease? What if you increase the weight? How does this apply to snowshoes? Demonstrate by bringing two tubs filled with snow inside. Placing a rock or heavy object into the first tub. How far does it sink? Now place that rock on a wider platform (a lightweight plate or piece or plastic) and place in the second tub. How far does it sink now? (Practice this first to find a rock or object with the right weight to demonstrate; it should not be so heavy that it sinks all the way down in the second tub!)
- Study animal winter adaptations that have the same function as snowshoes for people (snowshoe hare, lynx, mice, weasels, mink, prairie chicken, sled dog). Discuss other winter adaptations (hibernation, coat changes, etc.). Search your school yard or local park for signs of winter animals where students can experience winter as they identify adaptations. What other winter adaptations could inspire human invention for coping with winter? For example, using insulation in buildings or wearing down coats. In small groups, use inspiration from nature to invent something for humans to use in winter. For a long-term project, have design teams brainstorm, design, build, and ultimately use their invention over the course of several weeks.
- Research the importance of snow shoes to early settlers. Who used them? (Native people, hunters, trappers, prospectors, farmers, soldiers, explorers, voyageurs, etc.) What were their snowshoes made of? Who made them? How would life be different for them without snowshoes? Who uses snowshoes today? (modern scientists, hikers, etc.)

2009 Minnesota Academic Standards in Science

This lesson helps support the following state standards.

Strand 1 THE NATURE OF SCIENCE AND ENGINEERING

Substrand 2 The Practice of Engineering

Standard 2 Engineering design is the process of identifying problems, developing multiple solutions, selecting the best possible solution, and building the product.

Benchmark 1 Identify and investigate a design solution and describe how it was used to solve an everyday problem.

Benchmark 2 Generate ideas and possible constraints for solving a problem through engineering design.

Benchmark 3 Test and evaluate solutions, considering advantages and disadvantages of the engineering solution, and communicate the results effectively.

Substrand 3 Interactions Among Science, Technology Engineering, Mathematics, and Society

Standard 3 The needs of any society influence the technologies that are developed and how they are used.

Benchmark 1 Describe a situation in which one invention led to other inventions.

Strand 2 PHYSICAL SCIENCE

Substrand 1 Matter

Standard 1 Objects have observable properties that can be measured.

Benchmark 1 Measure temperature, volume, weight and length using appropriate tools and units.

Substrand 3 Energy

Standard 2 Energy can be transformed within a system or transferred to other systems or the environment.

Benchmark 1 Identify several ways to generate heat energy.

2010 Minnesota Academic Standards in Language Arts

Strand READING

Substrand Informational Text

Standard Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

Benchmark 4.1.1.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

Standard Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

Benchmark 4.2.3.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

Standard Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text relate to each other and the whole.

Benchmark 4.2.5.5 Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text.

Substrand Foundational Skills K-5

Standard None

Benchmark 4.3.0.3 Know and apply grade-level phonics and word analysis skills in decoding words.

a. Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g., roots and affixes) to read accurately unfamiliar multisyllabic words in context and out of context.

Benchmark 4.3.0.4 Read with sufficient accuracy and fluency to support comprehension.

a.Read grade-level text with purpose and understanding.

Strand WRITING

Substrand Writing K-5

Standard Write narratives and other creative texts to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Benchmark 4.6.3.3 Write narratives and other creative texts to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

a. Orient the reader by establishing a situation and introducing a narrator and/or characters; organize an event sequence that unfolds naturally.

b. Use dialogue and description to develop experiences and events or show the responses of characters to situations.

c. Use a variety of transitional words and phrases to manage the sequence of events.

d. Use concrete words and phrases and sensory details to convey experiences and events precisely.

e. Provide a conclusion (when appropriate to the genre) that follows from the narrated experiences or events.

Standard Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose, and audience.

Benchmark 4.6.4.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

Standard Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

Benchmark 4.6.7.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.

Standard Draw evidence from literary or informational texts to support analysis, reflection, and research.

Benchmark 4.6.9.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Standard Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

Benchmark 4.6.10.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Strand SPEAKING, VIEWING, LISTENING, AND MEDIA LITERACY

Substrand Speaking, Viewing, Listening, and Media Benchmarks K-5

Standard Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ides and expressing their own clearly and persuasively.

Benchmark 4.8.1.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and

expressing their own clearly.
a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.
b. Follow agreed-upon rules for discussions and carry out assigned roles.
c. Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.
d. Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.
e. Cooperate and problem solve as appropriate for productive group discussion.

Strand LANGUAGE

Substrand Language K-5

Standard Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

Benchmark 4.10.1.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
f. Produce complete sentences, recognizing and correcting inappropriate fragments and run-ons.*

Standard Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Benchmark 4.10.3.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.
a. Choose words and phrases to convey ideas precisely.
b. Choose punctuation for effect.
c. Differentiate between contexts that call for formal English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion).

Standard Acquire and use accurately a range of general academic and domain-specific words and prhases sufficient for reading,w riting, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension and expressions.

Benchmark 4.10.6.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal precise actions, emotions, or states of being (e.g., quizzed, whined, stammered) and that are basic to a particular topic (e.g., wildlife, conservation, and endangered when discussing animal preservation).

References and Resources

For Children

- Call of the Wild by Jack London
- Dr. Kate: Angel on Snowshoes by Rebecca Hogue Wojahn
- How Snowshoe Hare Rescued the Sun: A Tale from the Arctic by Emery Bernhard

- Snowshoe Trek to Otter River by David Budbill
- Summer Coat, Winter Coat by Doe Boyle
- The Rover Boys on Snowshoe Island by Edward Stratemeyer
- The Snowshoeing Adventure of Milton Daub, Blizzard Trekker by Margaret K. Wetterer and Charles M. Wetterer
- The Snow Walker by Margaret K. Wetterer and Charles M. Wetterer
- The Young Naturalist by Andrew Mitchell
- What Do Animals Do in Winter? by Melvin and Gilda Berger
- Winter Ecology Pre-Visits, http://www.uwsp.edu/cnr/cwes/PreandPosts/Winter%20Ecology%20Pre-Visit%20Activities.pdf
- Winter Ecology Teacher's Guide, http://www.nps.gov/glac/forteachers/upload/Winter%20Ecology%20Teacher%20Guide%202010.pdf
- Winter Feels Good www.winterfeelsgood.com and http://www.winterfeelsgood.com/flash/2007/Learn/roomain2.swf

For Adults

- A Season with Eagles by Dr. Scott Nielson
- A Trailside Guide: Snowshoeing by Larry Olmsted
- Hooray for Minnesota Winters! For Minnesotans (and Those Who Wish They Were) of All Ages by Paul Lowrie and Bret Nicholaus
- Snowshoeing: From Novice to Master by Gene Prater and Dave Felkey
- Stokes Guide to Nature in Winter by Donald Stokes
- The Snowshoe Experience: A Beginner's Guide to Gearing Up & Enjoying Winter Fitness by Claire Walter
- Deep Portage Conservation Reserve, 2197 Nature Center Drive NW, Hackensack, MN 56452.
- Minnesota Conservation Volunteer Teachers Guide, "Let's Go Snowshoeing!" Multidisciplinary Classroom Activities, http://www.dnr.state.mn.us/young_naturalists/snowshoeing/index.html
- River Bend Nature Center http://www.rbnc.org/schoolunits/snowshoe.htm
- Snowshoeing 101: The Basics of Snowshoeing, http://www.redfeather.com/content.asp?id=548&pageId=33
- "Packed to the Hilt" by Jeff Hull. Audubon November-December 2010

Credits

This field investigation was developed and written by Prairie Wetlands Learning Center Staff, U.S. Fish and Wildlife Service. Thank you to Prairie Science Class naturalist Trista Kitzman for reviewing this lesson. Thanks to the following teachers for reviewing this lesson plan: Martha Zemur, licensed teacher, Minneapolis; Jody Lunemann, Bertha-Hewitt Elementary; Deb Strege, licensed teacher, Fergus Falls.

Student materials follow.

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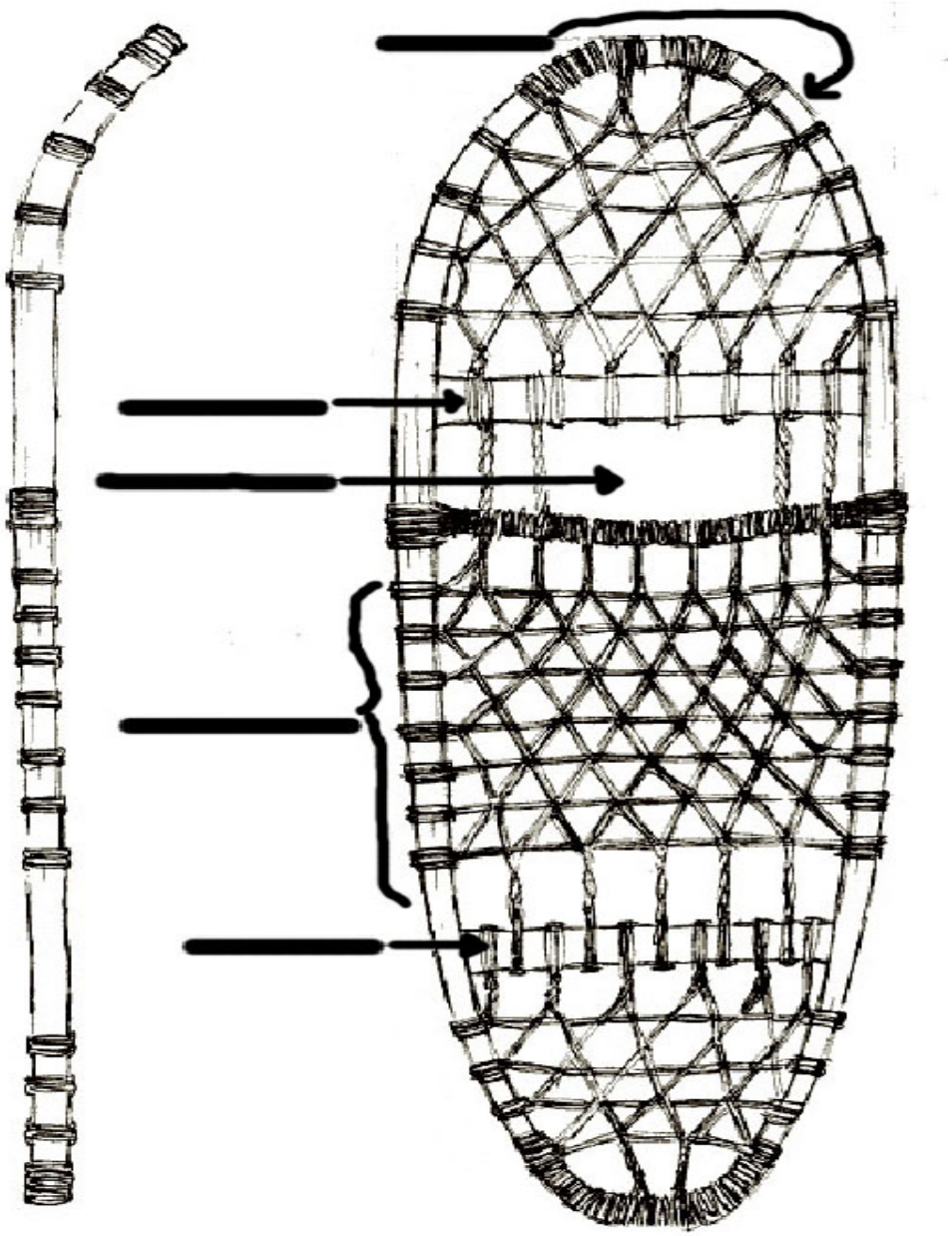
Traditional Snowshoe Diagram

Name:_____ Label the parts of the snowshoe using the word bank.



Word Bank

Heel Bar

Toe Hole

Toe Bar

Lacing

Frame

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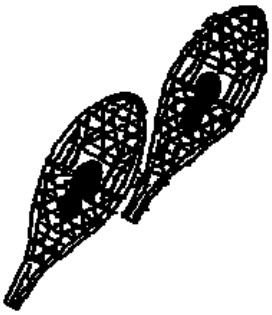
Types of Snowshoes

Different designs of the snowshoe developed for varying purposes. The following list shows three popular designs of ***traditional snowshoes****:*

Bear Paw

- oval in shape, lacking tail - for use in thick woods and hilly areas
- advantages: tight maneuverability
- disadvantages: slower than other styles and poor for deep snow



Michigan (Maine or Beaver-tail)

- tear-drop shape, up-turned toe, and narrow tail
- for use on trails or open woods
- advantages: versatility, will work fairly well in most situations
- disadvantages: clumsy in thick woods or in very deep, powdery snow
- by far the most popular design

Alaskan (Trail, Yukon)

- extremely long and narrow, greatly up-turned toe, and narrow tail
- for use in open areas and deep snow
- best for most racing
- advantages: handles deep snow, very fast, and tracks well over long distances
- disadvantages: poor maneuverability

Traditional snowshoes have further developed into the ***modern snowshoe*** design. They usually have a lightweight aluminum frame instead of wood and plastic decking instead of webbing. They also have cleats, or crampons, on the underside for increased traction.