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Winter Ecology

Subject Area: Natural Science

Core Curriculum Content Standards: 3.3A, 3.4A, 4.1A, 4.2D, 5.1A&B, 5.3A&B, 5.5A&B, 5.9A, 5.10A&B, 6.6E

DESCRIPTION:

This session involves a field hike that stresses the ecological conditions of winter including how plants, animals, and humans are influenced by, and react to such conditions. Students may participate in a variety of activities, including recording temperature ranges and wind chill, searching for microclimates, and animal tracking.

OBJECTIVES:

1. Students will identify and demonstrate the causes of winter.
2. Students will describe and search for examples of ways in which plants and animals have adapted to winter conditions.
3. By maintaining the temperature of a warm object in the outdoors, students will discriminate between climate and microclimate.
4. Students will compare, contrast, and evaluate the environmental effects of the ways in which humans and animals keep themselves warm in winter.

BACKGROUND INFORMATION:

MATERIALS NEEDED:

- Model Sun & Earth; • Challenges of Winter Cards; • Plant/Animal Adaptation Cards
- Groundhog Hibernation Cards; • Hot Plate & Beaker; • 1 Packet Gelatin
- Film Containers; • Two Max/Min Thermometers; • 1 Regular Thermometer
- Wind Gauge & Chart; • Rhododendron Chart; • Dearly Beloved Game
- Spring Scale; • Scavenger Hunt Cards; • Tracking Cards

PROCEDURES:

1. Ask students what the word winter brings to mind. Make a list of their responses.
2. For plants and animals, winter can be a challenge. Show each Challenges of Winter card and discuss how each example can make survival difficult for plants and animals.
3. Return to the card labeled “ Indirect Sunlight.” Do students know why the sunlight is considered “indirect” in winter? What causes winter? Choose two students to hold the sun and earth models and demonstrate the revolution of the earth around the sun *and* the earth’s tilt on its axis. You can add the rotation of the earth as well, to indicate day and night. Show how the earth’s axis always points in the same direction as the earth revolves. Therefore, the Northern and Southern hemisphere alternately tilt away from and toward the sun. When the Northern hemisphere is tilted away from the sun, the sun’s rays are spread out over a large surface area, instead of continuously beating down in a smaller, concentrated area, as they are in the Southern hemisphere at that time, or at the equator at all times. At SOC, the sun is *never* directly above us, as it is year round at the equator; we’re too far north. On June 21, it is about 72 degrees above the horizon and on Dec. 21, it is only about 36 degrees above the horizon. Indicate the difference in these angles with your hand. Distance of the earth from the sun has nothing to do with the change in seasons. In fact, the earth is actually closer to the sun in winter than in summer!
4. In preparation for the outside activities, choose one student to watch a beaker of 1 cup of water on a hot plate until it boils. While you are waiting for the water to boil, have students each draw a plant or animal adaptation card from the deck and discuss what each is and how each adaptation helps wildlife to survive. Inform the students that they should commit their adaptation to memory because they will be searching for an example of it (or related to it) when the group goes outside. To encourage understanding of the difference between dormancy and hibernation, show students the Groundhog Hibernation cards.
5. When the water boils, remove it from the hot plate and choose a student to pour in one packet of gelatin and stir the gelatin vigorously. While you are waiting for the gelatin to dissolve, point out that the adaptations discussed above can be categorized into three types:

Structural/physical: specialized body parts (short ears, appendages, thick fur)

Physiological: specialized body chemistry (alteration of body chemistry to accept seasonal change of diet)

Behavioral: specialized behavior (migrating, dormancy, huddling)

Can the students categorize the adaptation on the card they chose?

6. When the gelatin is dissolved, fill each film container about halfway. Pair up the students and give them each a film container. This container is a pretend “animal” that must find a shelter outdoors to keep it warm – in other words, to keep it from hardening into jello. Depending on the age and ability of the group, you may want to go over factors the students

should consider when searching for shelter, such as: the use of insulating materials, orientation to winter sun, protection from wind, size of shelter, etc.

7. Give the students 3-4 minutes to find shelter for their animals. Make sure students leave the flagging where it is visible and take note of exactly where they have hidden their animal. Wait about ten minutes before checking the animals.

8. While you are waiting, show students the minimum/maximum thermometers. Each thermometer indicates the coldest and warmest temperature in the last 24 hour period. The scale on the cold side is inverted, so that negative numbers are above the zero. Each temperature is read at the bottom of the blue line. First, have students read the high and low temperature on the thermometer hanging in the sun on the tree. Have them calculate the range for that day. Then, have them dig up the thermometer which has been hidden in the soil. What was the high and low in this burrow in the ground? What was the range? Discuss the concept of microclimates. Would this be a good shelter for an animal? Why? What would help to raise the high and low temperatures if an animal were living there?

9. Check each “animal” that the students have hidden. If the animal can be poured out, it survived. If it has hardened in the container, it did not. Be sure to point out the advantages and disadvantages of each shelter.

10. Hand out the scavenger hunt cards, or use the students’ memory of the animal adaptation cards to structure a scavenger hunt in the wildlife habitat or on a brief hike. If time allows, choose additional activities from the Winter Ecology Hike supplement sheet.

Summary

Review some of the adaptations that animals and plants have to keep themselves warm in winter. How do humans keep themselves warm in winter? In addition to our clothes and shelter, we heat our homes by burning fossil fuels – oil, gas, and coal, which are also nonrenewable resources. How does this human “adaptation” to winter affect the environment? Is there anything we can learn from animals to keep ourselves warm in winter that might cause less stress to the environment? Use the Wildlife Ideas for Energy Conservation to help kids hypothesize.

Bibliography

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Activities for Winter Ecology Hike

Lesson Plan Supplement

Activity	Materials
<p>Gelatin Activity: Fill the film containers with warm gelatin. Have the students, in pairs, find shelter in the wildlife habitat which will keep their gelatin from hardening (cooling) for about ten minutes. What resources do animals use to create warm shelters in winter?</p>	<p>beaker, hot plate, film containers with flagging</p>
<p>Rhododendron Temperature: Have students observe the leaves on the rhododendron by the side door of the nature center. Compare them to the chart. What is the temperature? How is curling up in cold weather adaptive for the leaves?</p>	<p>laminated chart, rhododendron outside of nature center</p>
<p>Max/Min Thermometers: Have students calculate the temperature range in a 24-hour period using the max/min thermometer hanging under the birdfeeders and compare it to the temperature range of the max/min thermometer buried underground. Which temperature fluctuates the least? Why? Which place provides better shelter for an animal?</p>	<p>max/min thermometers</p>
<p>Huddling: Have the students note the temperature using a thermometer. Give one student a second thermometer which reads the same temperature. Have students huddle together around that thermometer for one minute. Note the temperature. How high did it rise? What caused it to rise? What animals might huddle in winter?</p>	<p>two thermometers</p>
<p>Windchill Exercise: Have students calculate the windchill by reading the temperature on a thermometer and measuring the wind speed on a wind gauge. Then, use the chart to determine the wind chill. Why is it important to know the wind chill factor? Why does wind make us feel more cold?</p>	<p>thermometer, wind gauge, wind chill chart</p>
<p>Deer Twig Activity: Cut a six inch birch twig with a bud on the end to show students what a deer might browse on in the winter. If a deer needs to eat 5 lbs of food a day to maintain its winter weight, how many twigs must it eat? Weigh the twig, and have students calculate the problem. 1 lb = ~500 grams How can deer populations affect forest growth?</p>	<p>spring scale</p>

Activities for Winter Ecology Hike-cont'd.

Activity	Materials
<p>Dearly Beloved: Lay out the point cards on the ground and choose one child to be a deer. Show students the chart. Start the deer at the point value equal to marginal. Pair up the other students and hand each student a winter month card. Have them then draw situation cards from your hand in the order of the winter months. After each situation card is read, the deer moves forward and backward on the path, accordingly. Did this deer survive winter? What types of events helped it? What types hindered it? What type of deer is most likely to survive?</p>	<p>deer antlers, point cards, winter month cards, situation cards, point value chart</p>
<p>Scavenger Hunt: Hand out the winter features scavenger hunt cards and allow students ten to fifteen minutes to search for signs of animals and plant and animal adaptations. Point out winter features such as deer and rabbit browse, partially eaten nuts and cones, and insect galls and cocoons.</p>	<p>winter features scavenger hunt cards</p>
<p>Snowmelt Exercise: Have older students measure the average snow depth and, using the laminated sheet provided, calculate how many humans could be supported for one day by the meltwater from all the snow in Stokes State Forest. Why is water melting from snow in a forest or other natural area possibly more valuable than water melting from snow in an urban or suburban area?</p>	<p>meter sticks, dry or wet erase markers, laminated calculation sheet</p>
<p>Animal Tracking: Have students practice identifying animal tracks using the laminated card and the sand/track display in the nature center. Discuss the story that tracks tell, including, what, when, where, how and why. Take students to the wildlife habitat or on a hike to look for tracks in the snow.</p>	<p>sand/track display laminated tracking cards</p>
<p>Additional Activity/Notes:</p>	