



Boreal Superheroes

Age range: 8 to 12 (Junior)

Time: 30 minutes

Subjects: Science, Geography

Resources: *Tree Superheroes of the Boreal* (page 21), *Animal Superhero of the Boreal* (page 22) and *Match-Up: Superheroes of the Boreal* (page 23) worksheets.

Learning Outcomes

Students will learn how physical and behavioural adaptations of two common boreal species – one tree, one animal – enable them to thrive in the world's most northern forest.

Backgrounder

The boreal is the world's most northern forest. Along its northern edge, the boreal forms the treeline, above which no trees grow. Trees have to be hardy to thrive here. As indicated on the activity sheets, the most dominant tree species are conifers, which are well adapted to the cold temperatures, thin and acidic soils, short growing seasons and dry climate. These include black and white spruce, aspen, birch, tamarack, jack pine and balsam fir. In European and Asian boreal forests, Norway and Siberian spruce dominate. Throughout the vast Siberian section of Russia and in wet areas, larches are most common.

The snowshoe hare is also well suited to flourishing in the boreal. With an adaptable fur colour, long reach, broad feet and hardy young, it is no wonder this species is so prolific. Sometimes, as many as 600 animals live in one square kilometre!



Hook: Superheroes of Adaptation

Explain to your students that there are many animals and plants of the world that are extremely well adapted to their environment.

Procedure

1 Divide students into small groups, and have each group describe on paper as many adaptations as possible of some or all of the following organisms.

Afterwards, ask groups to present results.

cactus: desert (thick and waxy coating, shallow and widespread roots, spines to protect them from being eaten, slow growing, rigid structure)

camel: desert (special eyelids to protect from sandstorms, storage of water and fat in hump, relatively light coloured, wide-spread feet for walking on sand)

seal: land and cold water (large fat stores, oily fur to prevent cold water from reaching skin, nose closure when diving, flippers and tail)

dolphin: underwater (sonar clicks, long-range vision, aerodynamic body shape, ability to hold breath a long time, bradycardia: slowed heart rate during diving)

birds of prey: hunting from the air (talons to grip prey, extremely sharp vision, ability to dive quickly, sharp beak to tear flesh, thin lightweight bones for flying)

2 Have the students work through the activity sheets to discover the great extent to which conifers and snowshoe hare are adapted to Canada's boreal.

Extensions

Have students conduct research and make presentations about other species that have adapted to living in the boreal. These include: caribou, Golden Eagle, beaver, river otter, Arctic fox, grizzly bear, snapping turtle, bison, moose, lemming and many insect species. (For an extensive list, visit www.borealforest.org).

After these presentations, have the class vote on the best-adapted boreal species.

Answers

Tree Superheroes of the Boreal (page 21)

1. The conical shape of most conifer trees promotes shedding of snow and therefore prevents damage to branches. (Answer: Spruce)
2. Having narrow needles or leaves reduces the surface area through which water is lost, especially during winter when the frozen ground prevents plants from replenishing their water supply. As well, the needles of boreal conifers are covered in a thick waxy coating that is waterproof. (Answer: Pine)
3. The dark colour of spruce and fir needles helps the foliage absorb maximum solar energy. (Answer: Spruce, Pine)
4. Evergreens such as pine, fir and spruce retain their foliage over the winter, which means in spring they can begin photosynthesizing immediately. They do not need to waste valuable time in the short growing season to first grow leaves.
5. Conifers are pine, fir, spruce and larches (a deciduous conifer).

Animal Superhero of the Boreal (page 22)

1. Large, furry, long claws, powerful, broad (like a snowshoe!), widely spread toes.
2. Insects, bark, plants, grass, worms, frogs, shrubs and buds. A hare will even scrape flesh off a dead animal carcass for extra protein.
3. Eyes open, fully furred, can hop around upon birth.
4. Jumping (up to 3 m in one bound) and running (45 km/h).
5. Seasonally changing colour from brown to white and back again.
6. SNOWSHOE HARE.

Match-Up: Superheroes of the Boreal (page 23)

- | | |
|------|-------|
| 1: O | 9: E |
| 2: J | 10: D |
| 3: K | 11: B |
| 4: I | 12: G |
| 5: C | 13: F |
| 6: P | 14: H |
| 7: A | 15: M |
| 8: N | 16: L |



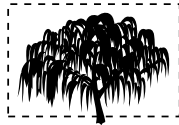
Tree Superheroes of the Boreal

The boreal forest is no place for wimps! The animals, birds, insects, plants and trees that live in this ecosystem are hardy and strong, able to withstand very cold and usually quite dry conditions. For each question, circle the type of tree, leaf or needle that will do best in the boreal.

1. **Lots of snow falls in the boreal.** Trees here need to be shaped so that the snow slides off easily; otherwise it builds up and breaks branches. Broken branches lead to reduced growth, disease, insect attack, and even tree death. Circle the tree shape below that lets snow slide off most easily.



Maple



Weeping Willow



Spruce



Poplar

2. **The boreal forest is very dry, even though it receives lots of snow.** Trees here need to prevent water loss through their leaves. Which leaves have the least surface area, thus the least loss of water?



Oak



Maple



Pine



Weeping Willow

3. **The boreal forest is very cold for much of the year.** Dark colours absorb maximum heat. Trees here need to have the darkest green leaves possible, because dark foliage absorbs the sun's heat more effectively. Which trees have the darkest leaves?



Maple



Weeping Willow



Spruce



Oak



Pine

4. **The boreal growing season is very short.** Trees that lose their leaves have to grow new ones each spring (deciduous), but trees that keep their leaves can start growing right away (conifers). Circle all the trees below that keep their leaves throughout the year.



Maple



Balsm Fir



Black Spruce



Poplar



Pine

5. **The soils in the boreal are very acidic.** Conifers are able to grow in acidic soils better than broadleaf (deciduous) trees. Which of the following trees are conifers?

PINE

FIR

MAPLE

POPLAR

SPRUCE

LARCH





Animal Superhero of the Boreal

Only the tough survive in the boreal! Animals in these forests and wetlands possess many behaviours and physical features that allow them to survive. Work through the questions below to learn more about a very well adapted boreal animal, one that is extremely successful at surviving in the world's most northern forest!

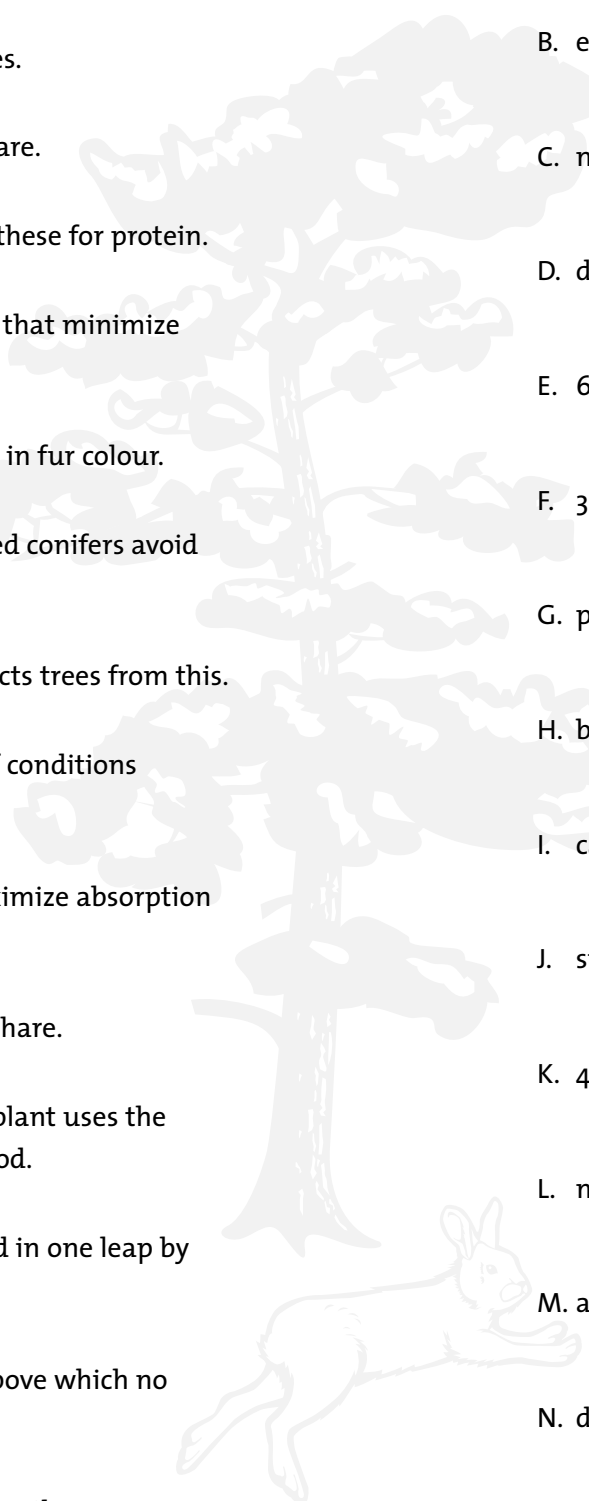
- This animal needs to move easily** over the soft snow of the boreal forest, with feet that can grip into the ground when speed is required. List five words that describe the type of feet and claws that come in handy in the boreal.
a) d)
b) e)
c)
- This animal must be able to eat almost anything.** Name five living things that a small animal can eat in the boreal forest.
a) d)
b) e)
c)
- The young offspring of a prey species must be able to survive on their own soon after birth.** Compared to baby mice, birds and kittens, the newborns of this boreal species are ready to go from birth. Can you think of two ways they are different from the other babies? (Hint: try to picture baby mice and kittens.)
a)
b)
- To be able to escape a predator, an animal needs certain abilities.** Name two skills that an animal could use to escape danger.
a)
b)
- This animal needs to be able to hide from predators** in the boreal summer, when the land is green and brown, and in the winter, when the boreal is usually snow-white as far as the eye can see. Describe an ability (regarding fur) that would help an animal become invisible in these changing environments!
a)
- Rearrange the letters below to learn the name of this boreal animal superhero!

WSONHSEO AERH





Match-Up: Superheroes of the Boreal

- 
1. Maximum number of litters born in a year to a snowshoe hare (litter is a batch of babies).
 2. Common boreal tree species.
 3. Top speed of a snowshoe hare.
 4. Hares will scrape meat off these for protein.
 5. Thin leaves of conifer trees that minimize water loss.
 6. Triggers moult and change in fur colour.
 7. In this weather, cone-shaped conifers avoid broken branches.
 8. Waxy coated needles protects trees from this.
 9. Number of hares in 1 km² if conditions are right.
 10. Colour of needles that maximize absorption of sun's energy.
 11. Predators of the snowshoe hare.
 12. Process by which a tree or plant uses the sun's energy to make its food.
 13. Maximum distance covered in one leap by snowshoe hare.
 14. Forms northern treeline, above which no trees grow.
 15. Conifers are able to thrive on these.
 16. Waste time and energy growing new leaves each spring (unlike conifers).
- A. heavy snowfalls
 - B. eagle, fox, wolf, bear
 - C. needles
 - D. dark green
 - E. 600
 - F. 3 metres
 - G. photosynthesis
 - H. boreal forest
 - I. carcasses
 - J. spruce, tamarack, pine
 - K. 45 km/hour
 - L. maple, oak, poplar
 - M. acidic soils
 - N. dry climate
 - O. four
 - P. amount of daylight

