



# Staying Warm in Winter Water



## Overview

How does a layer of fat help Minnesota water mammals stay warm in cold water? Students experience first-hand, the insulating capacity of fat as they coat their thumbs in a thick layer of lard and plunge their thumbs in icy water to learn how Minnesota water-dwelling mammals such as beavers and otters are adapted to survive the cold temperatures.

## Standards/Benchmarks \*

Living things are diverse with many observable characteristics. Science (2.4.3.1.1)

## Background

The word adaptation can be confusing because it is used to refer to physical or behavioral characteristics that allow an organism to survive and reproduce in its habitat. For example birds have hollow bones and feathers that make flight possible. Peacocks spread their beautiful tails to attract a mate. Adaptation may also refer to the process by which organisms may change over an extended period of time to adjust to a changing environment. Birds avoid eating Monarch Butterflies because they are poisonous. Birds also avoid the Viceroy Butterflies that look most like Monarchs.

In the biological sense, adaptation is not a result of conscious decisions by an animal. Confusion may also arise from the fact that we humans consider ourselves adaptable because we can make changes to fit our environmental needs. For example we wear warm clothes in winter and turn on our air conditioners in summer.

**About Beavers:** In addition to the dense fur and layer of fat under the skin, beavers have many amazing adaptations that allow them to survive in the aquatic habitat: strong wood-gnawing teeth which grow continuously to replace what is worn off, a flat tail that is used for balance or dam and lodge construction or a splashing alarm sound, a transparent eyelid for underwater vision, careful grooming habits of rubbing oil (from a gland at the base of the tail) onto fur for waterproofing, nostrils and ears that close when the animal dives.

## The Activity

### Warm Up

Have a discussion with students about how animals have special physical adaptations which help them survive. This lesson will help students understand that in order to survive, animals such as beavers, otters, and muskrats depend on thick waterproof fur and a layer of fat to keep them warm. Connect this idea to the fact that students need to change what they wear outside depending on the seasons.

### Time:

30 min.

### Skills:

Observing  
Documenting

### Vocabulary:

adaptation  
insulation  
fat

### Materials:

- Can of lard or vegetable shortening
- Containers filled with ice and water (dish pan)
- Paper towels
- Trash can
- *Minnesota Weatherguide Environment™ Calendar*

## Introduction

Hold up a winter scene picture from the *Minnesota Weatherguide Environment™ Calendar*, preferably showing open water. Discuss how different animals in Minnesota survive the cold winter and document student thoughts on the chalkboard. Explain that students will participate in an experiment to understand how some mammals stay warm in the water in winter.

## Activity

1. Fill a container full of water and ice (ice should not be packed). A dish pan works well.
2. Have each student, one at a time, put their finger into the water and document their reaction. Have them dry their finger. Have each student put lard or vegetable shortening around the same finger (make sure it is completely covered).
3. Put the finger back into the water and document the reaction this time.
4. Or to use time efficiently, thoroughly coat one thumb with lard and leave the other uncoated. Submerge both thumbs at the same time. Compare the differences felt.
5. Ask students to write a paragraph about the experience and the insulation that the layer of fat provided.

## Wrap Up & Assessment

Discuss what the students felt with their thumbs. Have students document the experiment and results in their science notebooks or journals.

## Questions for Discussion

- What provides animals with the fat layer? Food. Some animals such as bears and groundhogs have genetic adaptations that allow them to build up a large amount of fat for winter insulation from the cold or for hibernation.
- How does the fat layer keep the animal warm? It acts as an insulator. The animal's body heat is trapped under the insulating fat, which works with the fur to ward off the cold.
- What are some other animals that depend upon a thick fat layer for survival? Polar bears, seals, whales and dolphins.

## Extensions

- Have students do research papers on mammals such as beaver, muskrat, and otter that swim in cold water. What other characteristics do these animals have which help them survive?
- Compare two different kinds of fat such as lard and vegetable shortening to determine if one is a better insulation.
- Show examples of high fat and low fat foods that people eat.
- Show examples of high fat foods that animals eat in winter; i.e., bird seed, wild nuts, suet.
- Discuss other adaptations and behaviors that animals have for staying warm in winter: hibernation, a thicker winter coat of fur, snuggling in dens or underground burrows, and using snow as an insulator. Birds have a layer of down under their outer body feathers and can fluff up their feathers to trap their warm body heat.

## \* Minnesota Academic Standards

### Standards met

Subject	Code	Standard	Benchmark
Science	2.4.3.1.1	Plants and animals undergo a series of orderly changes during their life cycles.	Describe the characteristics of plants and animals at different stages of their life cycle.