# What is Hibernation?

## Video/Indoor Activity

### Curriculum: Science, Literacy

Watch this 19 minute video, Hibernation – Alberta Examples or cue to animals of interest, to learn from experts on how different animals in Alberta use hibernation to survive winter. Animals featured include:

- Ground Squirrels – Jeffery Lane, Associate Professor, Department of Biology, University of Saskatchewan (cue: 0 - 3:15 min.)
- Bats – Lisa Wilkinson, Species At Risk Biologist, Alberta Environment (cue: 3:16 - 5:54 min.)
- Grizzly Bears – John Paczkowski, Wildlife Ecologist, Alberta Parks (cue: 5:55 - 9:55 min.)
- Snakes – Roland Kirzinger, Education Coordinator, Fish Creek Provincial Park (cue: 9:50 - 14:04 min)
- Amphibians – Vicki Perkins, Education Coordinator, Kananaskis Country (cue: 14:05 - 19:06 min.)

### Learning Extensions – Experiment: Sugar as a Cryoprotectant

***How do amphibians that hibernate in the frost zone (where the ground freezes) survive*?** In this experiment, you will be exploring this inquiry by comparing the freezing rates of solutions that have and do not have sugar. As scientists, you will be documenting your observations.

### Vocabulary:

Cryoprotectant - a substance that can prevent tissues from freezing at low temperatures.

**Materials:** science journal, pencil, sugar, 2 identical containers, water, spoon, measuring cups, access to a freezer

## Instructions:

- Mix one part sugar to one part water in one of the containers (e.g. 250 ml sugar: 250 ml water). Stir until sugar is completely dissolved.
- Fill the second container with an equal amount of water to the first container.
- Place both containers in the freezer.
- Check the containers after 1 hour, 2 hours and 3 hours. Notice how the two containers freeze and reflect on the following in your science journal:
    - Is there a difference in the rate of freezing between the two containers?
    - Which solution freezes faster? Slower?
    - Do the solutions feel different when touched by the stirring spoon?
- Leave your containers in the freezer overnight or for at least 8 hours.
- Remove your containers from the freezer and leave them on the counter. Observe the rate at which the solutions thaw. Make note of the following in your science journal:
    - How long did it take each container to thaw?
    - Which solution thawed faster? Slower?
- Answer the following questions in your science journal:
    - Why is sugar a great adaptation for frogs that hibernate in the frost-zone?
    - Which Alberta Amphibian is the most widely distributed in Canada and can even be found above the Arctic Circle? You may have to do some research to answer this. Hint: it has an adaptation to survive cold temperatures!

## Discussion:

Amphibian species of Alberta survive the cold freezing temperatures of winter by hibernating. Most species burrow into the ground below the frost line (where the ground is not frozen) or into the mud at the bottom of a wetland where the water does not freeze to the bottom. There are a few species including the Wood Frog and the Boreal Chorus Frog that are freeze-tolerant and hibernate near the ground surface within the frost zone. They possess super powers to avoid becoming a frogsicle! This experiment provides insight into one way they are able to do this, through the adaptation of having a cryoprotectant – a substance that protects their tissues from

freezing at low temperatures.  What is the cryoprotectant frogs use? Sugar! While not as simple as this experiment, the concept is the same. Sugars in the frogs' tissues acts as an "antifreeze". This allows them to survive at sub-zero temperatures during hibernation.