Featured Lesson

Lesson 2:8 - Fish In Winter

by Scott Moeller, Aquatic Education Specialist

November 2011

Download this article PDF

Chapter 2 of the MinnAqua ***Fishing: Get in the Habitat!*** Leader's Guide contains nine lessons, all pertaining to understanding Minnesota Fish. This chapter covers topics from how fish perceive their world, to how to identify Minnesota fish, to the history of fishing in Minnesota. Part of being a fish in Minnesota involves coping with winter and the changes that winter brings to our rivers and lakes. **Lesson 2:8 – Fish in Winter** explores how winter conditions can affect dissolved oxygen levels in water and what this means for the fish.

Download the Lesson PDF

Lesson Summary

In this lesson, students play a simulation game in which they play the roles of fish attempting to survive a Minnesota winter. Through the course of the game, students discover how ice and snow cover can affect dissolved oxygen levels in the water, and why oxygen is the most important limiting factor for fish in climates with cold winters. By the end of the lesson, students should be able to explain dissolved oxygen and the importance of dissolved oxygen in the water, as well as identify natural factors that affect dissolved oxygen levels for fish in winter.

Tips & Tricks

- Students might have a hard time understanding that oxygen can be dissolved in water. Make sure to go over this with them, giving the very common example of soda pop as something they can relate to as proof that gases can be and are commonly dissolved in liquids.
- Not only does snow cover block sunlight in the lake in winter, but the angle of the sun is much lower in the wintertime and days shorter. You can use a simple "sundial" in a classroom window to demonstrate seasonal changes in the sun's angle, and discuss sunset and sunrise times in summer versus winter.
- Warm-blooded and cold-blooded can also be challenging concepts for students to fully grasp. Make sure they understand that the term "cold-blooded" is an imperfect term and, in fact, "cold-blooded" animals do not always have a cold body temperature, but a body temperature that changes with their environment. Similarly, be sure students understand that there are both advantages and disadvantages of being either warm-blooded or cold-blooded.
- Students may easily grasp the concept of localized oxygen depletion by perhaps recalling a time they were hiding under a bedsheet (or other scenario) and experienced increasing difficulty in getting enough oxygen. This could serve as a valuable analogy for the life of a fish in winter.
- In any game like this, the honor system is critical. You may find it helpful to explain to students

that the objective is not to “survive” at all costs, but to play the game honorably to explore the dynamics of survival and suffocation. Some students can be extremely sensitive about “winning,” so it may be good to emphasize that no one will be mocked for “suffocating” or rewarded for “surviving.”

Diving Deeper

- Set up some simple experiments in the classroom to explore concepts like:
  - How much snow does it take to block sunlight from penetrating the lake surface?
  - How much less light intercepts a lake’s surface in winter than in summer?
  - How much shorter is a winter day than a summer day?
- Have students research which Minnesota fish require high oxygen levels and which have a tolerance for low oxygen levels. Discuss the implications of this in regards to which fish are more likely to survive a winterkill and which fish are likely to be victims.
- Observe a local lake in late fall and early spring to predict and observe when ice forms and when ice goes out, and what environmental conditions cause both.
- Visit a local lake that has an aeration system and talk with local officials about the lake and the aeration system in winter.

MinnAqua Lesson Connections

Lesson 1:6 - From Frozen to Fascinating (30 pages | 3.8 MB) is another MinnAqua lesson that focuses on how other aquatic lifeforms deal with the rigors of winter. **Lesson 2:3 - Fish Families** (23 pages | 3.4 MB) could serve as springboard to talking about the many different Minnesota fishes and their varying tolerances for winter oxygen depletion. **Lesson 3:2 - The Function of Aquatic Plants** (24 pages | 3.5 MB) makes the connection with aquatic plants as one important way in which a lake obtains and maintains its dissolved oxygen. And, **Lesson 5:7 - Making Ice Fishing Jiggle Sticks** (19 pages | 2.8 MB) and **Lesson 6:2 - Ice Fishing and Winter Safety** (29 pages | 2.2 MB) both deal with the topic of going outside on a nearby frozen lake to “sample” some real live fish in winter.

Suggested Online Student Resources

Have your students access these online resources to engage in these concepts further.

- **How do fish breathe?**
- **Oxygen in lakes and ponds**
- **Low oxygen tolerances for some common fish species**
- **Aquatic oxygen depletion basics**