



# UNIT THREE



# TURTLE ECOLOGY





# UNIT THREE: TURTLE ECOLOGY

Science Expectations met in this unit:

Activity Number: Activity Name	Strand	Specific Expectations		
		Understanding Basic Concepts	Developing Skills of Inquiry, Design and Communication	Relating Science and Technology to the World Outside the School
10: Yawn, Stretch and Hibernate	Grade 2 – Growth and Changes in Animals	2, 4, 8	3, 5	1, 2
	Grade 4 – Habitats and Communities	1, 4, 5	3	
	Grade 6 – Diversity of Living Things	2, 3	1,3	5
	Grade 7 –Interactions Within Ecosystems	2, 8	1, 3	6
11: A Picture is Worth a Thousand Words	Grade 2 – Growth and Changes in Animals	4	3, 4, 5	1
12: A Link In The Chain	Grade 4 – Habitats and Communities	2, 3, 5	3, 4, 5	2, 3, 5
	Grade 6 – Diversity of Living Things		1, 3, 5	5
	Grade 7 –Interactions Within Ecosystems	3, 6, 8	1, 3, 5	6

# SECTION ONE:

## Hibernation

### It's cold out here!

Turtles are temperature-sensitive creatures. As **ectothermic** animals, turtles require heat from the environment in order to perform basic functions like eating and moving around. When the outdoor temperature drops to the point that they are unable to acquire sufficient heat, turtles begin to slow down. In cold climates, turtles overcome this problem by lowering their **metabolic rate** and entering a period of dormancy, commonly referred to as **hibernation**. By hibernating, turtles are much more energy efficient than birds and mammals, which either migrate south for the winter or spend it searching for food while trying to keep their bodies warm.

Cold weather and the reduced daylight are the predominant triggers for Ontario turtles to begin hibernation. But other factors also play a role. High summer temperatures cause turtles to **aestivate**. The spotted turtle is active as soon as the snow melts in March and April, but becomes inactive in the hotter temperatures of late summer. Scarce food availability has also been known to cause turtles to aestivate. In seasons of drought, the painted turtle will bury itself in order to avoid the difficult hunt for food, reemerging once the rains begin.

Environmental factors determine the length of time turtles spend hibernating.

For example, in extremely cold regions, locally adapted turtles will spend a majority of their life in hibernation, remaining active only for a few months in an entire year. Some turtles do not remain dormant for the entire hibernation period, as they move about in the water under the ice.

Turtles hibernate underwater in lakes, ponds, and rivers. Some leave the water to dig into the muck of wet springs or seepage areas.

### Breathing Underwater

Turtles that hibernate in the water still require oxygen through the winter, and possess special adaptations for breathing. These turtles absorb oxygen under the water in two ways. One way is through the throat cavity. The pharyngeal region (specialized blood vessels lining the turtle's mouth cavity) ensures oxygen replenishment. The other way involves the **cloaca** tissue (a common chamber in the vent area of the tail into which urinary, digestive and reproductive chambers empty). It also has blood vessels that absorb oxygen. As well, the turtle's inactivity and decreased metabolic rate reduce its need for large amounts of oxygen, allowing it to survive with minimal oxygen levels in its blood.

### Danger Ahead

One of the disadvantages of hibernating is the relative vulnerability of the turtle to predators and environmental factors. While dormant, turtles are stationary prey for raccoons, ravens, coyotes, otters, dogs and other predators. For aquatic turtles, another difficulty stems from the freezing of the pond. If all the water in the pond freezes, turtles hibernating underneath will freeze and die. As well, ponds that are frozen or covered with snow for prolonged periods become completely depleted of oxygen.



## **ACTIVITY #10: YAWN, STRETCH AND HIBERNATE**

### **TOPIC**

What makes a good turtle hibernation area?

### **BACKGROUND INFORMATION**

Students must use their listening and imagination skills to follow this imagery exercise. Teachers may want to review turtle hibernation with the students. For additional information, refer to Section One: Hibernation (pages 69-70).

### **MATERIALS**

Imagery Story: Sweet dreams, here I come!  
Student work sheet

### **METHOD**

Teachers should read aloud the imagery story "Sweet dreams, here I come!" on page 72. Students can then write a short reflection on how they felt as a turtle before hibernation.

### **EXTENSIONS**

Students can create their own storybook, complete with illustrations, outlining any chosen aspect of the life of a turtle. For example, they can illustrate turtle nesting and the laying of eggs.

# Sweet dreams, here I come!

The days start to get colder. There is a cool breeze in the air. The leaves on trees have started changing colours and the days are getting shorter. I'm feeling really tired and it is getting harder and harder for me to find food. Take today, for instance. I waited in the water all day for some small fishes to swim by. But, I was too slow to catch any! I had to settle for some plants that I saw by the water's edge. I think it is about time that I take my winter nap. So I need to prepare.

First, I have to find a really great hiding spot. I like to sleep under the water, where it's nice and cozy. But I have to make sure that the pond is deep and does not freeze to the bottom. Under water is warmer than the freezing cold air.

The spot I pick is the same every year. It's been pretty good to me. It doesn't freeze and it's safe from raccoons that like to eat me when I'm defenceless. I would be in big trouble if this area changed and my little secret spot was gone. I would have nowhere to go. That would be really awful and scary. There's a lot to think about when getting ready to hibernate! And sometimes I have to swim a long way to find my spot.

Under all that ice, breathing becomes a little difficult. I get enough oxygen from an opening near my tail, called a cloaca, and my throat. My deep sleep also helps. I don't use as much oxygen this way as I do when I am awake.

I am really, really tired now. So I think I will stop talking. It is time for me to go to sleep, but I promise I will be back. Look for me in the spring. I'll be the one coming out of the water, maybe a little slow, basking in the warm sun, definitely very hungry but ready for new adventures. See you there!



## **ACTIVITY #10: YAWN, STRETCH AND HIBERNATE**

Record how you felt after hearing “Sweet dreams, here I come!”  
What kinds of problems do turtles face when getting ready for hibernation?

## SECTION TWO: Ecological Connections

### **An important link in the chain**

Turtles have an important role in the ecology of their surroundings. From eggs to young hatchlings and finally into adulthood, turtles are both predator and prey. Turtles feed on a variety of plants and animals and the turtle and its eggs are preyed upon by a variety of mammals, birds and fish.

Most turtles are carnivorous but the diet of the turtle may vary from hatchling to adulthood. Occasionally, a young turtle will begin life as a carnivore. However as it grows, it may switch to a diet richer in plant material. Even snapping turtles alter their diet preference to include a surprising amount of plants at certain times of the year. The following list displays the variety in the turtle diet:

<b>Plant Life</b>	<b>Animal Life</b>
Duckweed	Frogs
Leaves	Tadpoles
Blue-green Algae	Small Fish
Green Algae	Insects
Fruits	Snails
Seeds	Dead Duck

As an integral component of the food chain, the turtle often fulfills the role of 'recycler.' Many turtles are scavengers, feeding on dead and decaying matter. In this manner, turtles remove much of the debris from the ecosystem, thereby ensuring that the stored energy can be reused.

### **Threats to survival**

Humans are the greatest threat to the turtle population. The loss or alteration of wetlands reduces turtle habitat. Many pollutants accumulate in turtles and their eggs. Turtles are consumed as a food delicacy, captured for their shell and as ornaments, are killed on roads, caught accidentally by anglers, or are collected for use in the pet trade. Road mortalities are one of the greatest human threats to turtles. Female turtles must often cross roads to reach their nesting sites, putting the eggs at risk. Potential animal predators include raccoons, foxes, skunks, otters, crows, snakes, fish, mink and even larger turtles.

A turtle's shell helps protect it from predators, but other risks exist. Nesting females are at great risk while they are on land and many females are killed or maimed by predators while laying eggs. Turtle nesting sites are usually great sources of prey for raccoons, coyotes and skunks, since the eggs are left unprotected by the parents. In addition, ants, maggots and mould have been known to threaten the survival of the eggs in their nesting sites. Human recreational activities on sandy areas along rivers and lakes also pose a threat.





## ACTIVITY #11: A PICTURE IS WORTH A THOUSAND WORDS

### TOPIC

What types of food does a turtle eat and what animals eat turtles?

### BACKGROUND INFORMATION

This activity is geared towards the primary level.

For this activity, students should familiarize themselves with the diet, and predators, of turtles. A short list of foods turtles consume is included in Section Two: Ecological Connections. Teachers or students can conduct further research (depending on grade level). Teachers can also refer to the Turtles of Ontario Fact Sheets (pages 10-26) for further details regarding the diet of specific Ontario turtles.

### MATERIALS

Student work sheet (photocopy two for each student)

Old magazines, calendars, newspapers, flyers and any other sources of animal pictures, or draw your own plant or animal pictures.

Scissors

Glue

### METHOD

Using magazines, newspapers flyers and other sources of pictures, students will create two different collages, one depicting the types of food that turtles eat and the other displaying the predators of different turtle species.

Students should begin by creating a list of foods that turtles eat as well as a list of predators. Pictures of these items should be drawn or cut from various sources and pasted onto the blank student work sheet. In the blank box at the top of the student work sheet, students should include an appropriate title for each of their collages. Instruct students that no "white spaces" should be visible on their page.



**ACTIVITY #11:  
A PICTURE IS WORTH A THOUSAND WORDS**





## ACTIVITY #12: A LINK IN THE CHAIN

### TOPIC

What is the role of turtles in the food web?

### BACKGROUND INFORMATION

Students should understand the meaning of food web and be acquainted with the components of the turtle food web. The diet of the turtle as well as potential predators of the turtle should be known. A short list is included in Section Two: Ecological Connections, although other prey is listed in the Turtles of Ontario Fact Sheets and Turtle Identifier Cards. If students choose another type of turtle, additional research must be conducted. For additional information on other varieties of turtles, refer to Unit Five: Turtle Conservation.

### MATERIALS

Old magazines, newspapers, flyers, and other pictures or drawings  
Construction paper  
Scissors  
Glue  
String / Yarn (coloured)  
Wire hanger (one per student)

### METHOD

Students will be creating a food web using cut outs of foods that the turtle eats and of the predators of turtles. Students should each select a particular turtle species that they wish to represent.

To begin, research should be conducted in order to determine the exact types of food that comprise the diet of the chosen species as well as the predators of this species. Students should create a food web using their research and include their turtle. An example is shown below:

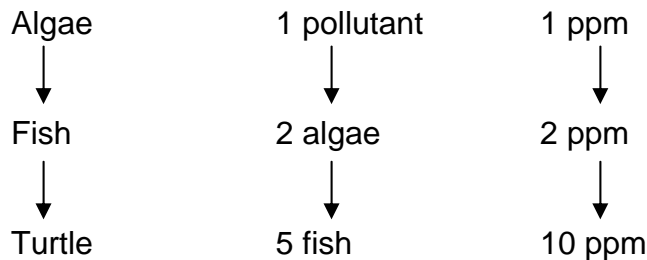
Plants → Worms → Fish → Spiny Softshell Turtle → Raccoon

Following their research, students should locate pictures of the different foods and predators in their web. If this is difficult, students can also draw pictures of the items. Each picture will

represent one of the organisms listed in the original food web. A hole should be placed in the picture through which a piece of string can be woven. In a straight chain, students will attach each of their pictures to the next link in their chain using either string or yarn. Side chains are added after the initial chain is completed. The entire chain should be attached to the wire hanger so that it can hang properly. Students should complete follow-up questions to further explore their web.

In addition, you can demonstrate the dramatic impact of pollutant **bio-accumulation** by explaining the following using the chalkboard:

- 20 parts per million (ppm) of a pollutant will kill turtles.
- A small amount of this pollutant is released into a lake from a sewage treatment plant. This is not enough to kill a turtle or fish.
- The pollutant is absorbed by algae at a level of 1 ppm.
- Fish eat the algae and absorb the pollutant into the fat at a level of 2 ppm.
- A turtle eats five fish a week.
- In two weeks, the turtle has accumulated enough of the pollution in its fat to cause death.
- This is bio-accumulation.



2 weeks = 2 x 5 fish (10 ppm) = 20 ppm (enough to kill a turtle!)



## ACTIVITY #12: A LINK IN THE CHAIN

### Follow-Up Questions

1. List the components of your turtle food web.
2. Draw an outline of your food web.

3. What is the role (producer, consumer or decomposer) of each of the organisms in your food web?
4. What happens to the food web if the turtle population decreases?
5. Remove one of the organisms in your turtle food web. How does this action impact on the other parts of the web?
6. What effect would humans have on your turtle food web? List a few examples of both positive and negative effects.

## SECTION THREE: Turtle Behaviour

### **Playing With Turtles?**

Did you know turtles could play? Well, neither did scientists! Recently, that changed. Traditionally, of all vertebrates, only birds and mammals were thought to be able to “play” (interact with objects in a manner not directly associated with food or other necessities for life).

However, in the 1990s, Dr. Gordon Burghardt of the University of Tennessee in Knoxville published a study documenting the play behaviour of a Nile soft-shell turtle at The National Zoo in Washington, D.C. The turtle manipulated objects, such as a ball, and swam through a hoop. It was the first time play behaviour was recorded in turtles, and the first time for any creature at a level lower than birds!

More recently, Toronto Zoo keepers contacted Dr. Burghardt to tell him of similar behaviour they witnessed in Toronto Zoo turtles. As a result, the Toronto Zoo keepers participated in a subsequent study to confirm play behaviour in turtles. They studied two Nile soft-shell turtles (Garth and Dottie), observing their interaction with objects such as a large plastic hoop, large plastic balls, and logs. Garth, the turtle in the smaller enclosure, tended to investigate the objects more frequently than Dottie, who was in a larger enclosure. Mark Krause, a student of Dr. Burghardt who did the study’s analysis, proposed the theory that perhaps Garth was more interested in the foreign objects than Dottie because he was in a smaller enclosure, causing less energy expenditure and maybe fueling boredom.

The zoo keepers were pleased with the findings of these two studies, since they indicate the zoos have succeeded in their efforts to provide environments that encourage natural behaviour in turtles. Moreover, the keepers were excited to confirm that turtles, like other animals, need and benefit from play opportunities and additional enrichment materials.

The play behaviour documented in these studies is probably an extension of behaviour that occurs in a turtle’s natural environment. Turtles may utilize similar behaviour to find food under logs or rocks, or to investigate if certain items are edible. Turtles are inquisitive by nature, and this behaviour can be transferred to foreign enrichment items placed in tanks with the turtles.

As they learn of this newfound knowledge about turtles, people’s attitudes towards reptiles and turtles may improve. Reptiles may no longer be viewed as cold and uninteresting, and instead will be recognized for the magnificent creatures they truly are.