

Ages:

6 & up

# Why Reptiles Bask - Hot vs. Cold

**Contributor:** John Wiessinger, Artist & Naturalist

**Main idea:** Some cold-blooded animals are dark-colored to make better use of the sun to stay warm.

**Objective:** Learn how some cold-blooded animals (ectotherms) regulate their body temperature and why it's important for them to be "warm." Students will:

- q Learn to identify which colors are best at absorbing heat from light.
- q See firsthand the value of dark turtle shells vs. light ones.
- q Learn the difference between ectotherms and endotherms (warm-blooded animals).

## **Materials:**

- q 3 T-shirts (white, medium color, dark)
- q 2 dishpans
- q Ice cubes

**Motivator:** This activity can help students choose what color T-shirt to wear based on the weather.

**Questions:** Before beginning the activity, ask the students:

- q Does it make sense for you to choose the color of your T-shirt based on what the weather is going to be?
- q Do you think the color of an animal has any effect upon its body temperature?
- q What are cold-blooded animals (also called ectotherms)? A: Animals that are the same temperature as their surroundings. Examples: Reptiles, amphibians, fish, insects, spiders, worms.
- q What are warm-blooded animals (also called endotherms)? A: Animals that maintain a constant body temperature. Examples: Mammals, birds.

**Activities:**

**Does warmth make a difference?**

How easy is it to untie a knot when your hands are cold? Ask for two volunteers. Place hands of one in a dishpan of ice water for 3 minutes. (Allow the student to remove hands if it becomes too uncomfortable. Have the second volunteer place their hands in warm water.

At the end of the three minutes, have a race to see which can untie a knot the fastest. (Make sure the knot requires some manual dexterity to untie, such as fairly tight knot in a shoelace.) Have the volunteers switch dishpans, or select new volunteers and repeat.

If humans are warm-blooded (endotherms), what's happening to make our hands cold? Our blood vessels shut down, restricting, (not eliminating) blood flow to our hands. This prevents too much heat loss from our bodies.

Cold-blooded animals such as butterflies, bees, and reptiles bask in the sun to raise their body temperature when it's cold. Fish will even swim to warm water to raise their temperature. Warm-blooded animals (birds and mammals) will also seek out sunny spots to help stay warm, but their body temperature stays relatively constant.

## Sun worshipers

Painted turtles are the turtles found farthest north in North America. So it's not surprising that their shells are so dark in color. Here's something you can try to see how a turtle's dark shell color helps it stay warm.

1. Select 3 T-shirts made of the same material: one white, one black or very dark, and one of medium darkness.
2. Spread the three shirts in a sunny location on the floor or outside and wait 10 to 15 minutes.
3. Now place your hand on the middle of each piece and feel its warmth. Sometimes it's best for your students to feel the difference between the shirts without looking first, so you may want to have them close their eyes and have someone else place their hands randomly on each of the 3 pieces to see how well they can tell.
4. If you have access to three thermometers place one on each of the shirts. Measure and record the temperature of each.

Can you feel a difference between each of the three? How is the dark one different from the white one and what about the medium colored one? (Dark surfaces absorb heat better than lighter surfaces and medium surfaces absorb heat some where between the two.)

### Learning checks:

Ask the students if what they wear on a particular day should be based on the kind of weather they're expecting for that day. What color would be best for cold days? Warm days?

## **Vocabulary:**

**Ectotherms:** Animals that are the same temperature of their surroundings, often called cold-blooded animals.

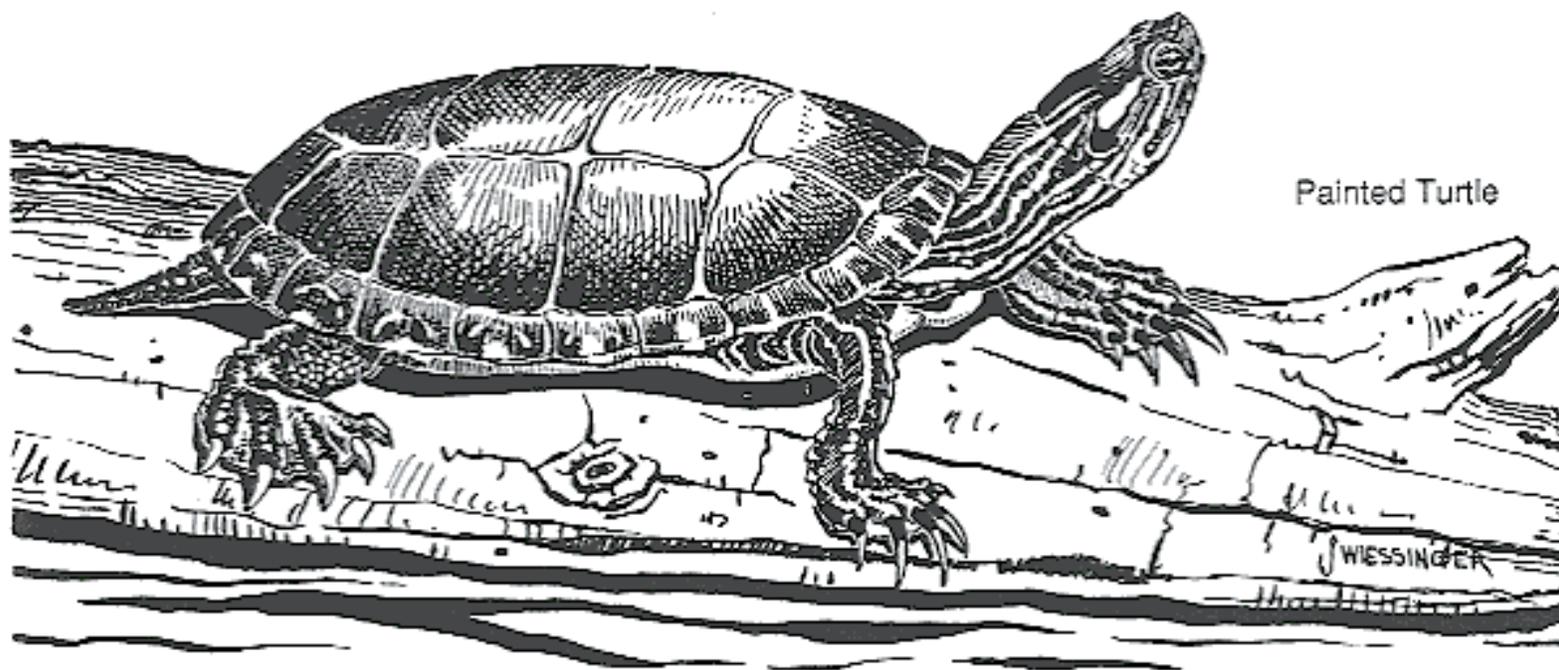
**Endotherms:** Animals that maintain a constant body temperature, often called warm-blooded animals.

**Thermoregulation:** Thermo = temperature. Regulation = control. How animals control their body temperature.

**Background:** See [“Right Before Your Eyes—Sun Worshipers at this link.](#)

## Sun Worshipers

Sunbathing is a common pastime during warm weather. Pond turtles are especially eager sunbathers, using the sun's warmth to help their bodies work efficiently. Like all reptiles, turtles are ectothermic (EK-toe-therm-ik), or coldblooded, with a body temperature that varies with that of their surroundings. The lower their temperature, the slower their movements. After a turtle has spent hours in a cool pond, sunning raises its body temperature and increases its activity level. That can make the difference in a world in which survival of the fittest really counts!



Painted Turtle

The next time you see a sunning turtle, don't frighten it. Remember that it isn't just enjoying the sun -- it's trying to survive.

## RIGHT BEFORE YOUR EYES - Sun Worshipers

Thermoregulation, accomplished by moving into or out of the sun, is practiced by all reptiles but is probably most obvious, to the casual observer, with turtles. Thermo-regulation in turtles is most highly developed in the pond turtles. These are the turtles one often sees piled on on another on a log during warm weather, each one trying to get its share of the sun's warming rays. By controlling their heat gain and loss, these turtles are able to elevate their body temperature to some "preferred" level above the surrounding environment.

Air and water temperature are of prime importance in initiating or terminating sunning. A recently emerged turtle often orients itself to receive maximum solar radiation and as its temperature approaches its preferred level, it may alter its posture to reduce heat gain. Once a certain temperature (about 78°-82°F) is reached, it either retreats to shade or to the water where it can forage at maximum efficiency. Sunning serves several functions: it warms the muscles to allow for quicker movement, it is a marked aid in speeding up digestion, it probably helps the maintenance of healthy skin by decreasing skin parasites and algal growth and may also help the turtle in the production of vitamin D.

Painted Turtles (see poster) are one of the most common pond turtles in North America. Named for the elaborate red and yellow patterns on its body, which seem to have been painted on, this turtle is the only one that ranges across the continent. Four subspecies, probably the result of glaciation, are recognized: the Eastern, Midland, Southern, and Western Painted Turtles. Each subspecies is fairly easy to distinguish but areas where the overlap confuse identification due to inbreeding.

Painted Turtles prefer slow-moving, shallow water with a soft bottom, basking sites, and aquatic vegetation. Their diet is omnivorous, with young turtles preferring diets high in animal material. As they age, their diet includes more vegetable matter. There are many animals that prey on Painted Turtles; Gray Squirrels, skunks, foxes, Raccoons, and Garter Snakes are just some of the animals that eat their eggs. Mink, Muskrats, snakes, larger turtles, and fish prey on the young, but humans with their pesticides and cars may be this turtle's worst enemy. Depending on the geographic location, Painted Turtles are less active, or almost completely inactive, during the winter. They may bask on warm winter days, however, and some have even been seen slowly swimming beneath the ice of a frozen lake. Respiration beneath the ice would seem difficult, but some aquatic turtles can augment their respiration by using the lining of the oral cavity as a sort of gill. Water is brought in through the nostrils and oxygen is extracted from the water by the highly vascularized pharyngeal passages of the mouth and throat, greatly increasing their ability to remain submerged during cold weather.

Turtles are often collected and brought home as pets. Commercial turtle food often proves inadequate and it is best to provide a wide variety of fresh foods to ensure a well-balanced diet. Mortality is often very high during the winter months; it is much better if the turtle is released in its original (or at least similar) habitat when fall begins.

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Harless, M. & H. Morlock. 1979. *Turtles: perspectives & research*. John Wiley & Sons, NY.

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