

# Conservation Matters

*A monthly column focused on conservation education, as the result of collaboration among several area conservation commissions and organizations. If your town's commission or conservation organization would like to contribute articles, please contact Jessica Tabolt Halm [jess\\_tabolt@hotmail.com](mailto:jess_tabolt@hotmail.com)*

**Title:** Where do Frogs Spend the Winter?

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Some early harbingers of spring have yet to be heard. In past years by now we have heard the quacking calls of the wood frogs as they emerge from their winter 'naps' and head for partially melted vernal pools and small ponds to mate and lay eggs. There is still snow and ice on these breeding pools. Where are the tree frogs? Where do frogs overwinter? How do they survive freezing temperatures?

Some species in New Hampshire (bull, green and pickerel frogs) overwinter in the bodies of water they inhabit during the rest of the year. Ice makes this possible. In its frozen state, water is less dense than in its liquid state. Frogs can spend the winter sleeping on the bottom where the water is the warmest. Their metabolism slows and very little energy is needed as they sleep through the winter. Tree frogs seem to arouse from their winter slumber earlier than frogs under the ice.

The tree frogs (wood frogs and spring peepers) spend most of the season in moist areas in the forests around bodies of water. Both species require water for reproduction. What they do to survive the winter is a marvel of science. They crawl under a thin layer of leaf litter and freeze, along with the soil around them. Sugar is the substance that keeps them alive - not the sugar that you would put into your coffee or onto your breakfast cereal - but a simpler form of sugar called glucose. Tree frogs store glucose in their liver as glycogen, a complex storage molecule. When the surrounding temperatures begin to fall (to about 28°F) ice crystals begin to form in the thinner areas of the frogs' bodies, in their feet, in the spaces between the cells. This event stimulates the liver to release huge amounts of glucose into the blood and then into the cells. Blood glucose levels can increase 200 fold in eight hours, until the frog becomes severely diabetic.

During the freezing process, a frog's heart rate increases, and will continue at a higher than normal rate while the freezing process ensues. The glucose in the cells prevents ice from forming within the cells and prevents damage to the cell membranes. The freezing process can continue until 60-65% of the frog's body fluids are frozen, which can take about 20 hours. At this point the heart has stopped beating and breathing has stopped as well.

Observations have shown that frogs will not survive below temperatures between 18 and 19°F. Snow is very important to their survival, as a thick snow cover can provide adequate insulation to maintain a temperature above this threshold. On a warm early spring day, a frog may emerge from its frozen hibernation and slip right back into it as the temperature drops below freezing. The glucose antifreeze is returned to the liver to be stored as the frog revives and the glycogen can again be tapped for antifreeze when freezing reoccurs.

The snow is disappearing and the ice is melting. Listen for the 'quacking' of the wood frogs soon. They will be followed by the peepers as the lilacs come into bloom.