

# WHITE LAKE

PROPERTY OWNERS ASSOCIATION  
ENVIRONMENT VOLUNTEERS



## ENVIRONMENT BULLETIN

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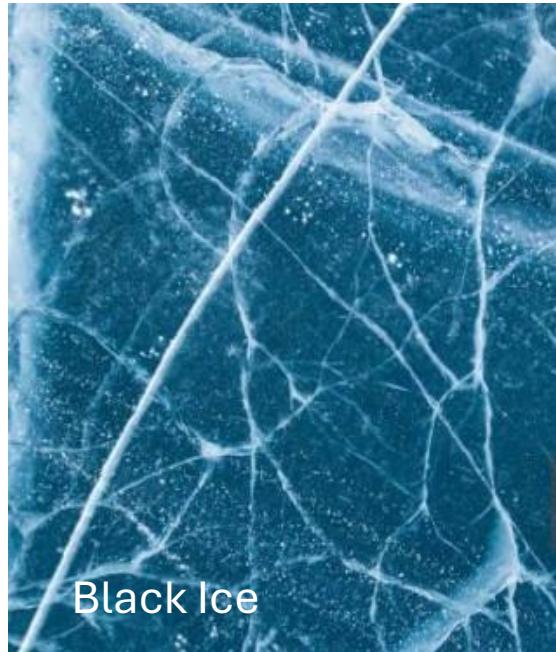
### The Evolution of Lake Ice



**First Ice Crystal Formation**

The formation of and changes occurring in lake ice during the winter season is the subject of thousands of scientific reports and dozens of books. Lake ice evolves through distinct phases from winter freeze-up to spring break-up. Air temperature, sunlight and wind all play a part in this transformation. Here is a simplified summary of what happens.

**Formation of first ice crystals:** During the fall, air temperatures decrease and eventually fall below the freezing point of water..... $0^{\circ}\text{C}$ . Lake water also cools and at some point reaches  $+4^{\circ}\text{C}$ , the temperature at which water is at heaviest density. Denser water sinks pushing warmer water to the surface and eventually the entire lake reaches  $+4^{\circ}\text{C}$ . Once this happens, the surface water on the lake continues to cool to below freezing. All that is needed now is for conditions to be calm and then ice crystals begin to grow forming a transparent sheet of ice referred to as 'black ice'.



**Thickening of the ice:** Once a stable sheet of black ice is formed, the ice layer begins to thicken from the bottom. Ice is an insulator, so as the ice thickness increases, the rate of ice formation slows down. If it gets really cold out, this will increase the thickening of the ice.

**The formation of snow ice:** Snow plays a very important role in ice formation because it is a good insulator. Snow cover slows the transfer of heat from lake water to the atmosphere slowing black ice growth. Eventually the weight of the snow pushes down on the ice and cracks in ice allows water (top water) to rise into the slow layer forming a new layer of white ice or snow ice on top of the black ice. Currently, by the end of February, the ice has reached its maximum thickness.

**Spring melting and ice decay:** When air temperatures begin to rise again and daylight hours lengthen, sunlight becomes the dominant force. Sunlight penetrates the snow and snow ice warming the water and lake bottom which melts the ice from the bottom.

The sunlight also causes melting along the edge of ice crystals in the snow ice turning the solid sheet of ice into vertical loosely-connected crystals known as 'candle ice'. This ice is very weak and subject to wind and waves and breaks up into smaller pieces.

The final disappearance of the ice can occur overnight. With the ice gone, wind mixes the lake water from top to bottom and recharges the oxygen in the water which has been partially depleted during the winter.

**Environmental and Climactic Significance:** Ice cover isolates the water from the atmosphere while limiting light penetration and oxygen renewal. This creates a challenging environment for aquatic life, especially fish.

***The length of time that a lake is covered with ice is an effective climate change indicator. For White Lake, we know that the number of ice-free days has increased by 19 days since 1979. These extra days results in increased use of the lake by cottagers, increased shoreline erosion and more frequent and longer algal blooms.***

**Additional Reading:** In recent years, we have written several Environment Bulletins which add to the information provided here:

1. [Decline in duration of ice cover on White Lake since 1979](#)
2. [Water and Ice](#)
3. [Water on Ice](#)
4. [The Power of Ice](#)
5. [What's Going on Down Under](#)

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