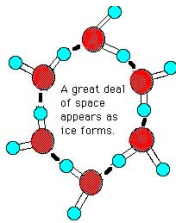


Seasonal Magic: How Ice Out in Lakes and Ponds Helps Nourish Life



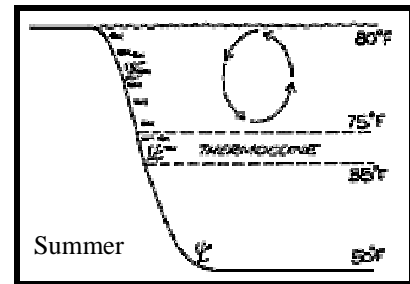
For some peculiar reason, when water freezes to ice, it floats. This is one of the unusual properties of water. When most compounds change from liquid to solid they become heavier. But not water. Water molecules become less dense (spread further apart) as water freezes.

If not for this unique property of water, lakes would freeze solid from the bottom up, and there would be little if any living things in them. After all, what kinds of organisms could survive in solid ice? Ice would remain deep in the lakes like permafrost in the arctic tundra.

How does ice over happen in a lake or a pond?

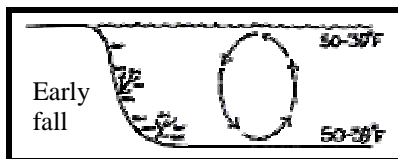
Each winter, as water cools, its molecules crowd closer together, until it cools to a “magic” temperature (39.2 °F, or 4° C), where it reaches its heaviest density and sinks to the bottom.

Normally the surface water of a lake is easily mixed as wind blows over the surface. For instance in the summer only the top layer of warm water 75 °F to 80 °F is mixed.

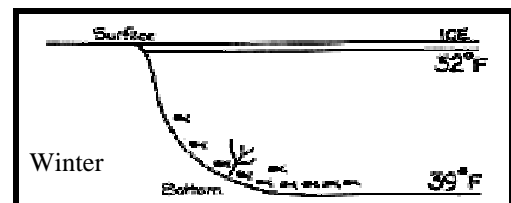


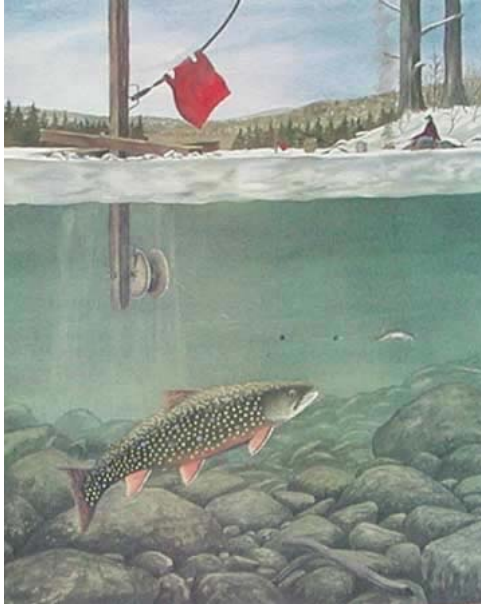
Before a lake can freeze over, its entire water column from top to bottom, must reach that magic temperature (39.2° F or 4° C). This natural cooling process is called *fall overturn*. It is a gradual process as the surface water slowly cools down and a larger and larger layer of water can be mixed by the wind. In rare cases, some lakes never completely mix at turnover.

Lake turnover is a very important event, a time when the water body mixes. The mixing water carries up nutrients (food) from bottom sediment to the surface. This happens in both spring and fall. The bottom sediment is filled with nutrients and when that nutrient rich water floats to the surface in fall and spring, it carries up nutrients to the phytoplankton, algae and other plant life as part of the food web.



After the entire body of water reaches magic temperature, 39.2 °F or 4° C, the water on top can finally get cold enough to freeze. Small ponds tend to ice over earlier in the winter than deep lakes, because there is less water to cool. Some very deep lakes never freeze because the entire depth of the lake does not cool down to the magic temperature. Most Maine lakes are shallow enough and winter is long and cold enough, so that they freeze over. During some really cold winters, some lake ice can be as much as six feet thick!





In winter most fish spend their time near bottom, where the food and warmest (39.2°F) water lies. As an exception salmon (and other species on occasion) will cruise the colder waters just under the ice. Oxygen is often richer close to the surface in winter. Many ice fishermen catch salmon just below the ice.



Ice-out begins in late winter as the sun becomes stronger and starts to melt the ice and warm the water from 32° F to 39°F (the magic temperature). As the ice melts it forms pencil-like crystals arranged vertically through the ice mass. The ice becomes crystallized or “honey combed”.

If you are lucky enough to be nearby a lake the day of ice out, you may hear a “tinkling” sound. The pencil-like ice crystals fall against each other like dominoes when the waves of open water nibble at the ice edge, creating that special sound.

Any weedy areas and rocks, logs, or any other solid objects in the water will absorb the sun’s rays and heat up the water around it. Even a leaf blown out onto the ice will melt its way downward in the ice. Often a band of open water develops along shorelines before the ice weakens over the deeper, middle part of a lake.



After ice out, the water once again is a uniform magic temperature of 39.2 °F, or 4° C and can freely mix, with the help of wind and currents. Then those valuable bottom nutrients are recycled to nourish living things near the surface.

All the living organisms that have been dormant come to life and start growing again. Spring overturn also happens to be the best time for spring fishing because the mixed uniform water, now filled with oxygen, brings trout and other species up from their deep winter retreat. They can be found at any depth at this season.

Excerpts from an article by Warren P. Balgooyen. Edited by Matt Loosigian, Deb Avalon-King and Christine Smith. Lake graphs from Missouri Dept. of Conservation