

Chautauqua Watershed Notes
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Fall Changes Below the Surface of Chautauqua Lake
By Priscilla Titus



The onset of winter dormancy belies the important changes taking place below the lake's surface that will affect next year's lake conditions.

It is late fall and the time of year when visual reminders of winter's onset are evident across the landscape. Leaves have left the trees, seeds are dispersing from late blooming plants, and animals are busy collecting what stores they can for the oncoming season of rest. Along the lakeshore, emergent plants have receded and cattail stands are brown and rattling temporary havens for migratory birds taking a brief respite from wind, rain and snow. For most of us, these are the signals that tell us to adjust our lifestyle to the short days and cold weather that will make spring so welcome in just a few months.

In the waters of Chautauqua Lake, a revolution of sorts is taking place. In all large water bodies, a process known as thermal stratification occurs in which the water is separated or stratified into distinct layers due to differing temperature and thus different density. One of these liquid layers is a region known as the thermocline, where temperatures adjust more rapidly with depth than they do in the more stable layers above or below. The position of the thermocline is not fixed, but migrates in response to varying conditions.

In the summertime, the top layer, known as the epilimnion, is warmed and oxygenated at the surface, whereas the bottom layer, called the hypolimnion, is cold and still but slowly loses oxygen due to the respiration of animals living there. During this time the thermocline is sandwiched between, and subsequently separates, these other layers.

As fall nighttime temperatures drop in the Chautauqua Lake watershed, surface waters become colder and denser until eventually these surface waters are heavier than the bottom layer, and gravity begins to draw the surface water downward. Movement of water including waves and currents assists in shifting water from one layer to another. Mixing during this time results in the dissolution of the thermocline. As the temperature continues to drop, the water on the surface may get cold enough to freeze and form a layer of ice, which protects the lake from wind action and concludes mixing. In early spring when ice has melted, temperatures are nearly the same throughout all depths and this allows profuse mixing even if there is little motion to encourage movement. This phenomenon is known as spring turnover. Thus, Chautauqua Lake mixes twice a year, in the spring and in the fall.

The features of thermal stratification of a particular waterbody are unique, as they are linked to a myriad of complex relationships including the interactions of seasonal variations that change from year to year, and the size, shape, and depth of the waterbody. Chautauqua Lake is characterized by two distinct sub-basins; therefore, two unique patterns of thermal stratification may develop reflecting the characters of each of the sub-basins.

Scientists studying global climate change are concerned that changes in the extent and duration of ice cover on lakes and streams will affect these systems by changing nutrient cycling, plant growth and lake turnover patterns. One thing to bear in mind is that bottom waters moving to the surface bring with them nutrients that have accumulated over the summer. This enriching of surface nutrients sometimes produces blooms of nutrient-loving plants including phytoplankton, algae and other aquatic vegetation. Phytoplankton blooms increase turbidity and can correspondingly affect light penetration. Thus, the spring turnover of 2010 may bring into evidence the effects of this summer's contributions to the bottom sediments in the lake, and these effects will in turn set the stage for the future characteristics of the lake and the flora and fauna that depend on the watershed.

The Chautauqua Watershed Conservancy is a local, private not-for-profit organization supported primarily by membership donations and grants from private foundations. Its mission is to preserve and enhance the water quality, scenic beauty and ecological health of the lakes, streams and watersheds of the Chautauqua region. It is the only locally-based not-for-profit organization actively conserving important habitats, scenic sites and watershed lands in the county. It takes a preventive approach to address lake algae and plant problems. For a list of upcoming events go to <http://www.chautauquawatershed.org/> or call 664-2166.