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Lake Eutrophication

What is lake aging?

Lake aging is the natural process by which a lake fills in over geologic time with erosional materials carried in by tributary streams, with materials deposited directly from the atmosphere, and with materials produced within the lake itself. From the time a lake is created through glacial action, the aging or filling in process begins. Although New Hampshire's lakes have the same chronological age, they age (fill in) at different rates due to differences in runoff and watershed characteristics. The natural succession is from lake to pond, pond to marsh, marsh to meadow, and meadow to dry land. Examples of each can be seen today including areas of dry land where past lake basins can still be identified.

What is eutrophication?

Eutrophication is the process of increased productivity of a lake as it ages. Often this process is greatly accelerated by human influence and is termed cultural eutrophication. The increase in nutrient supply from human activities usually results in an increase in the biological production that occurs in the lake. Although the increased production may increase the rate of lake filling, it is incorrect to define eutrophication as lake aging. A lake does not die when it reaches a state of high productivity, but when it no longer exists (is filled in). Lake filling results both from production that occurs in the lake, which may increase with eutrophication, and from organic and inorganic material deposited from outside the lake, which has no relationship with lake eutrophication.

What activities cause Eutrophication?

Since eutrophication is increased nutrient input, any activity in the watershed of a lake that increases nutrient input causes eutrophication. Land use changes can result in significant changes in nutrient runoff. Studies in New Hampshire have shown that phosphorus export from agricultural lands is 5 times greater than from forested lands, and urban areas may be more than 10 times greater. Stormwater runoff from these developed land areas is the major source of nutrients for most lakes. Other activities that contribute to eutrophication are lawn and garden fertilizers, faulty septic systems, washing with soap in or near the lake, erosion into the lake, dumping or burning leaves in or near a lake, and feeding ducks.

What is meant by Trophic State?

The trophic state of a lake is a hybrid concept with no precise definition. Originally, trophic referred to nutrient status. Eutrophic water was water with high concentrations of nutrients and, by extension, a eutrophic lake was a lake that contained eutrophic water. Later the concept of trophic state was applied to lakes rather than water, and its precise definition was lost. Now

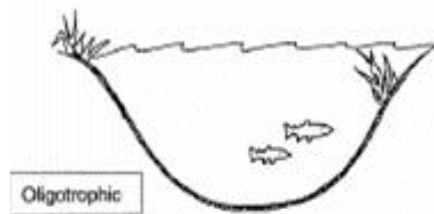
trophic state not only refers to the nutrient status of the water, but also to the biological production that occurs in the water and to morphological characteristics of the lake basin itself. Now a eutrophic lake may not only be a lake with high levels of nutrients, but also a very shallow pond, full of rooted aquatic plants, that may or may not have high levels of nutrients.

Lakes are divided into three trophic categories: oligotrophic, mesotrophic, and eutrophic. The prototypic oligotrophic lake is a large deep lake with crystal clear waters and a rocky or sandy shoreline. Both planktonic and rooted plant growth are sparse, and the lake can support a coldwater fishery. A eutrophic lake is typically shallow with a soft and mucky bottom. Rooted plant growth is abundant along the shore and out into the lake, and algal blooms are not unusual. Water clarity is not good and the water often has a tea color. If deep enough to thermally stratify, the bottom waters are devoid of oxygen. Mesotrophic is an intermediate trophic state with characteristics between the other two.

For tips to help protect lakes from cultural eutrophication, see <http://des.nh.gov/organization/commissioner/pip/factsheets/bb/documents/bb-9.pdf> For more information on a variety of lake programs and topics, visit <http://des.nh.gov/organization/divisions/water/wmb/lakes/index.htm>

Oligotrophic

- a. Steep shoreline and bottom gradient
- b. Low nutrient enrichment
- c. Little planktonic growth
- d. Few aquatic plants
- e. Sand or rock along most of shoreline
- f. Coldwater fishery
- g. High dissolved oxygen content



Mesotrophic

- a. Moderate nutrient enrichment
- b. Moderate planktonic growth
- c. Some sediment accumulation over Most of lake bottom
- d. Usually supports warm water fish species



Eutrophic

- a. High nutrient enrichment
- b. Much planktonic growth (high productivity)
- c. Extensive aquatic plant beds
- d. Much sediment accumulation on bottom
- e. Low dissolved oxygen on bottom
- f. Only warm water fish species



Figure 1. Lake classification.

<http://www.bloomfieldtpw.org/images/Graphic-LakeBoard.gif>