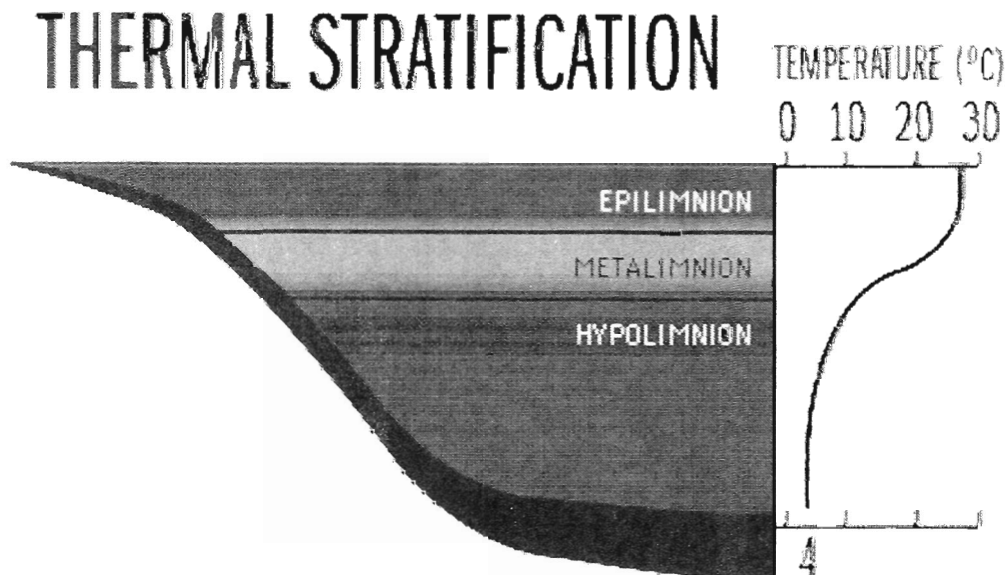


Ecology of Ponds

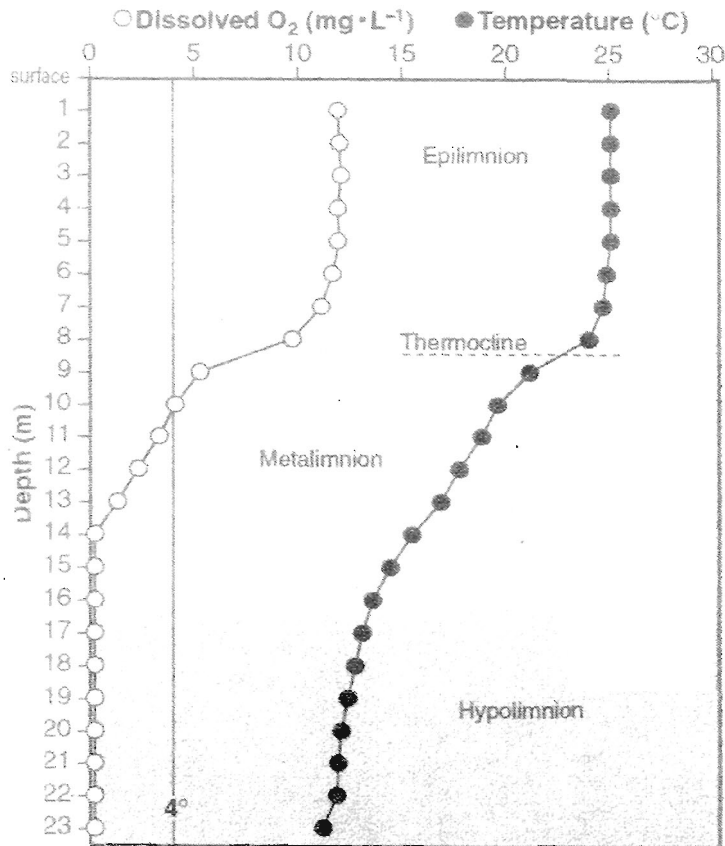
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Most of the energy and food in a pond is provided by the photosynthesis of microscopic plants called algae and larger vascular plants called macrophytes. As nutrient concentrations and temperature increase, primary production increases. The types and sizes of plants affect the kinds of organisms that can eat them, which in turn determines which predators can eat these organisms. When this plant material dies, it is decomposed by bacteria and fungi, removing oxygen from the water. Food can also enter a pond from the surrounding terrestrial ecosystem or be put into ponds as fish food. This material also can provide food for aquatic organisms and will also deplete oxygen as it decomposes.

When sunlight enters the water, it is absorbed by water molecules and transformed into heat energy. Longer wavelengths (red) are absorbed to a greater degree than shorter wavelengths (blue and violet). Most of the light is absorbed in the upper two meters of the pond. Water has its maximum density at 4°C. Warmer water is less dense. As the upper water warms and becomes less dense, the wind cannot mix the pond to the bottom and the lake becomes stratified. The upper layer of warmer, less dense water is called the epilimnion. The lower layer of colder, more dense water is called the hypolimnion. The zone of transition between the epilimnion and hypolimnion is called the metalimnion.



When the lake is stratified, the hypolimnion cannot be reaerated from the atmosphere. If the lake is lower in productivity, the colder water will hold more oxygen than the upper, warmer water. But if the lake is highly productive, the decomposition of the organic matter will deplete the oxygen and create a lower zone with extremely low oxygen concentrations. Ice cover in a productive lake in winter also can deplete the oxygen because the lake cannot receive oxygen from the air.



Lake Mendota Summer Stratification 17 July 2000

The food webs in ponds are complex. The shapes and types of organisms at different trophic levels can determine the outcomes of their interactions. Production can be driven by the supply of nutrient and be reflected in the production of higher trophic levels (bottom-up control). Alternatively, the strong influence of top predators in a simple food web can cause a top-down effect or trophic cascade, in which the predator reduces the abundance of its prey, the food of that prey increases, potentially decreasing the abundance of aquatic plants. Introduction of additional species can alter the trophic interactions and change the ecological dynamics of the pond.

