Chapter 7 Lakes and Reservoirs
Stratification / Turnover / Mixing

- Heat, light, density difference with depth
- Annual cycle for a temperate lake
Thermal (Summer) Stratification

- Epilimnion
- Metalimnion (Thermocline)
- Hypolimnion --- COLD
Temperature as a function of depth for Triangle Lake, Oregon, on October 1, 1983, and positions of epilimnion, metalimnion, and hypolimnion. (Data from R. W. Castenholz).
FIGURE 2-3  The thermal and optical structure of a lake with depth during the period of summer thermal stratification.
Thermal resistance to mixing

**FIGURE 6-2** A summer temperature profile (single line) and relative thermal resistance to mixing (bars) for Little Round Lake, Ontario. The relative thermal resistance (R.T.R.) to mixing is given for columns of water 0.5 m deep. One unit of $R.T.R. = 8 \times 10^{-6}$, that is the density difference between water at 5 and at 4°C. The R.T.R. of the lake water columns is expressed as the ratio of the density difference between water at the top and bottom of each column to the density difference between water at 5 and 4°C. (Modified from Vallentyne, 1957.)
Holomixis

- Lake mixing
  - Amictic
  - Monomictic
    - Warm
    - Cold
  - Dimictic
  - Meromictic
  - Polymictic

*FIGURE 6-7* Schematic arrangement of thermal lake types with latitude and altitude. Black dots: cold monomictic; black-and-white horizontal bars: transitional regions; horizontal lines: dimictic; crossed lines: transitional regions; vertical lines: warm monomictic. The two equatorial types occupy the unshaded areas labeled oligomictic and polymictic, separated by a region of mixed types, mainly variants of the warm monomictic type (*broken vertical lines*). (Modified from Hutchinson and Löffler, 1956.)
FIGURE 6-4  Depth-time diagram of isotherms (°C) in Lawrence Lake, Michigan, 1968. Dashed line indicates the upper metalimnetic-lower epilimnetic boundary. Ice cover drawn to scale. (Modified from Wetzel et al., 1972.)
Implications

- Stratification
- Turnover (mixing)