

# Chemistry

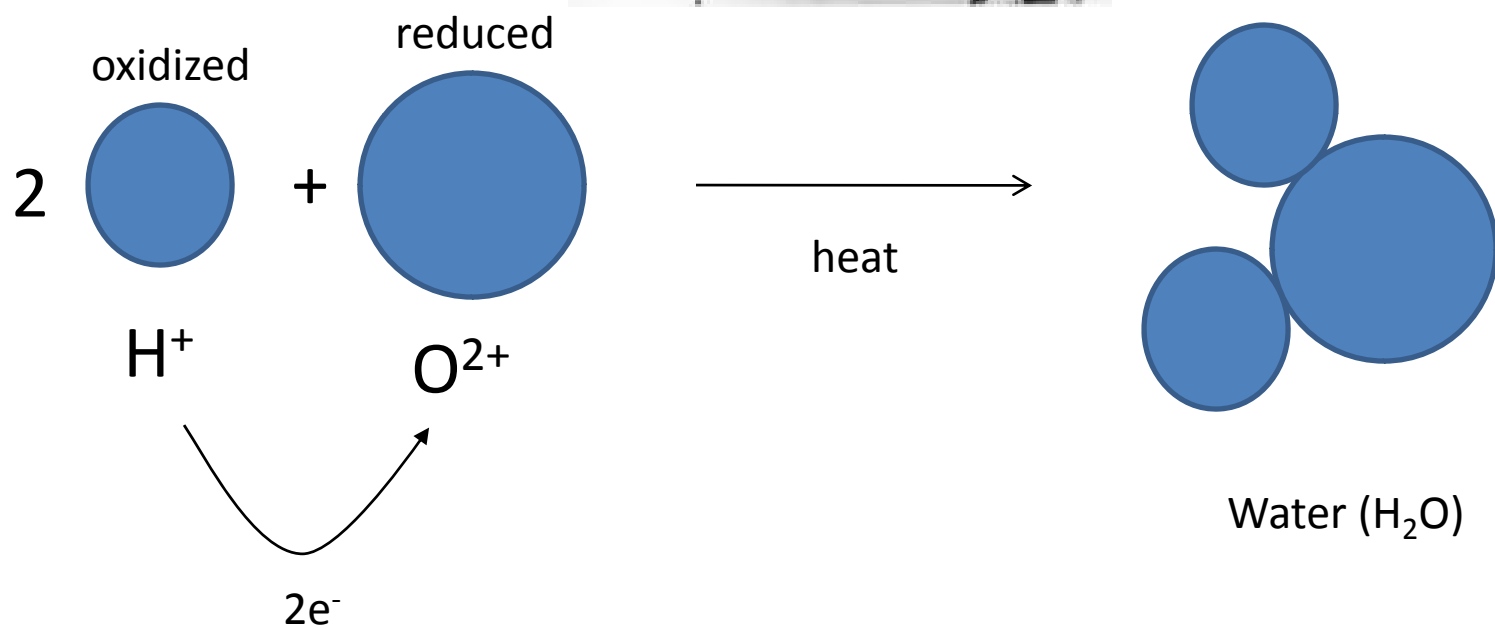
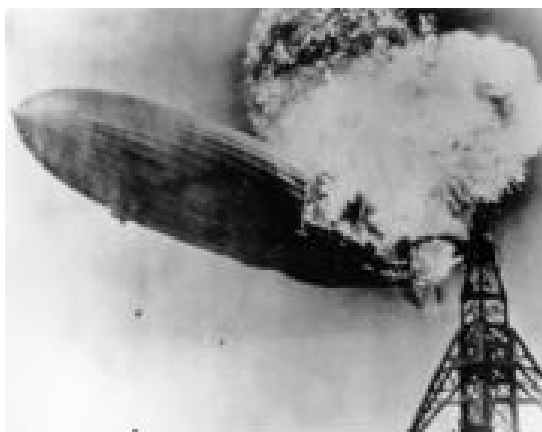
- Oxygen
- Carbon Dioxide
- pH
- Ions
- P, N, micronutrients

# Dissolved gases

- Gases can be dissolved in water (depending on their solubility)
- Atmospheric Gas
  - $N_2$  – 79% (largely chemically inert)
  - $O_2$  – 21% (very chemically active...good and bad)
  - $CO_2$  – 0.03% and currently rising
- Dissolved into water from atmosphere and biological/abiotic sources...

# Dissolved Oxygen

- Most important gas biologically
  - Highly electronegative (accepts electrons)
  - Necessary for all aerobic processes (i.e., respiration)
  - Drives reduction-oxidation reactions (redox)
    - (reduction – substance gains electrons; always occurs with something else losing electrons through oxidation).
    - Thus, oxygen is a strong oxidizer (and is reduced in the process). E.g.,  $\text{Fe}^{2+}$  is oxidized when reacting with oxygen

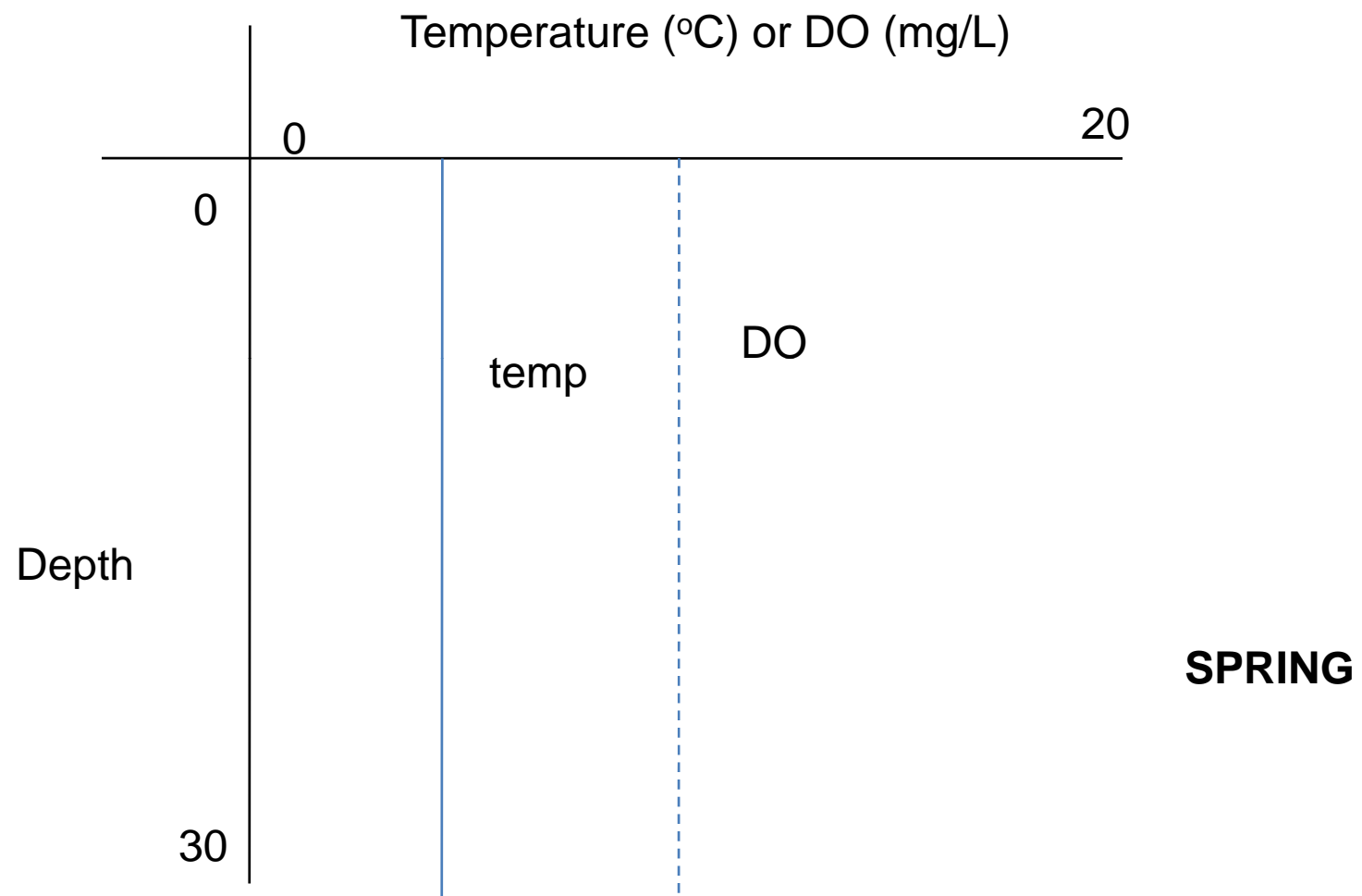


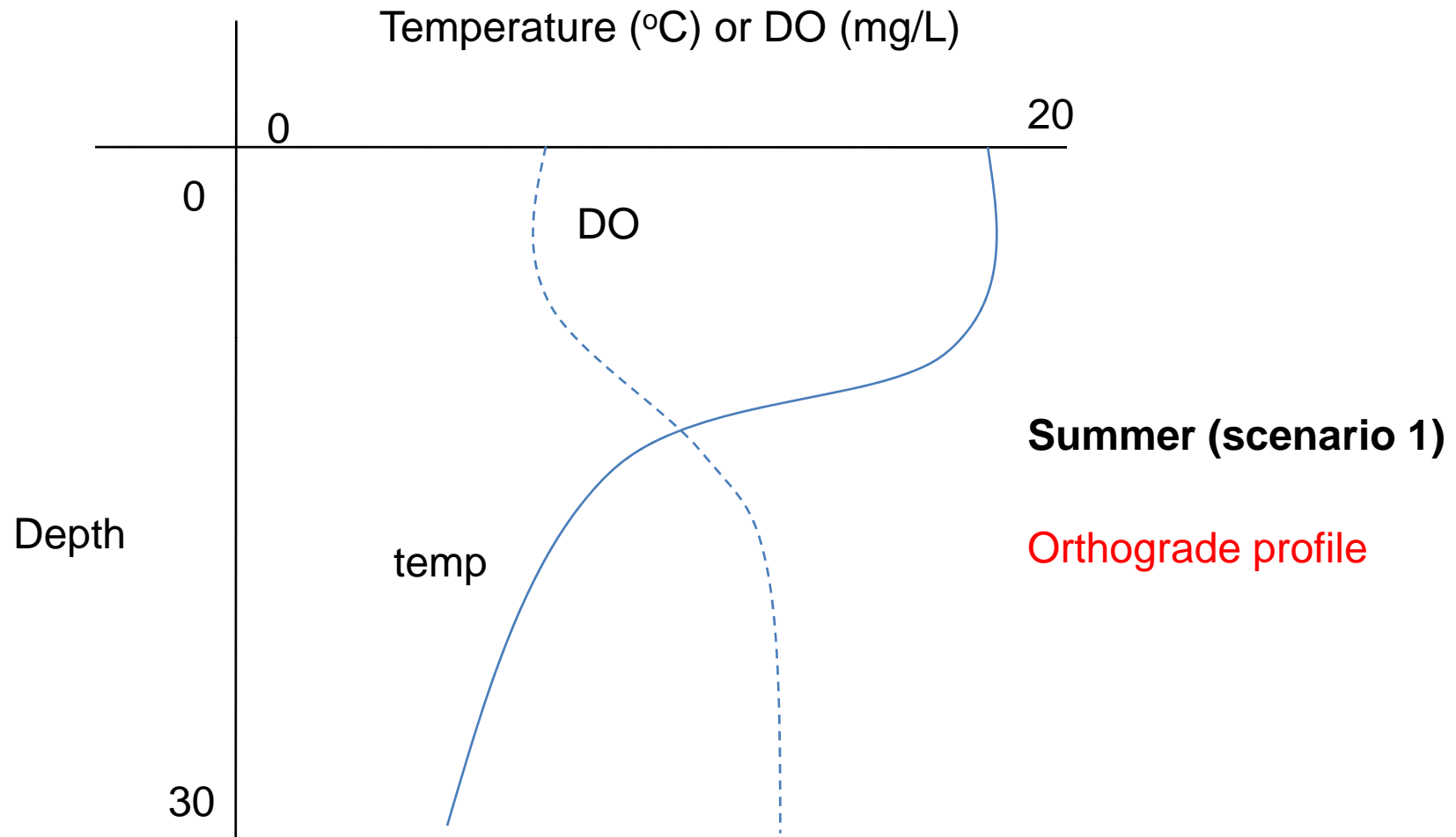
# Dissolved Oxygen

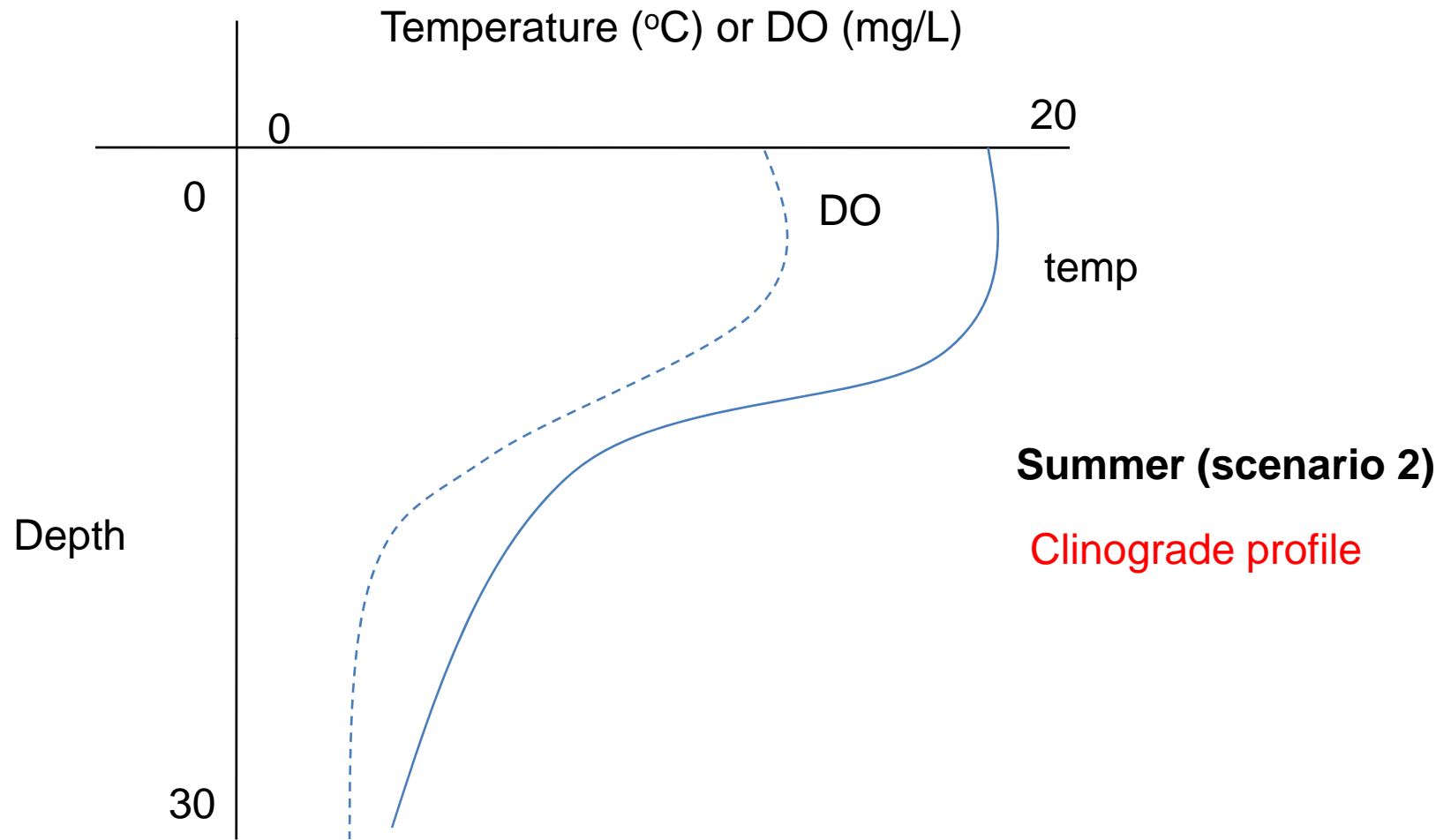
- Sources (as dissolved gas):
  - Atmosphere (diffusion)
  - Photosynthesis (production)
  - Hydromechanical (wind)
  - Inflow (stream & rivers)
  - Groundwater (sometimes)
- Loss of the dissolved gas
  - Photosynthesis
  - Chemical reactions

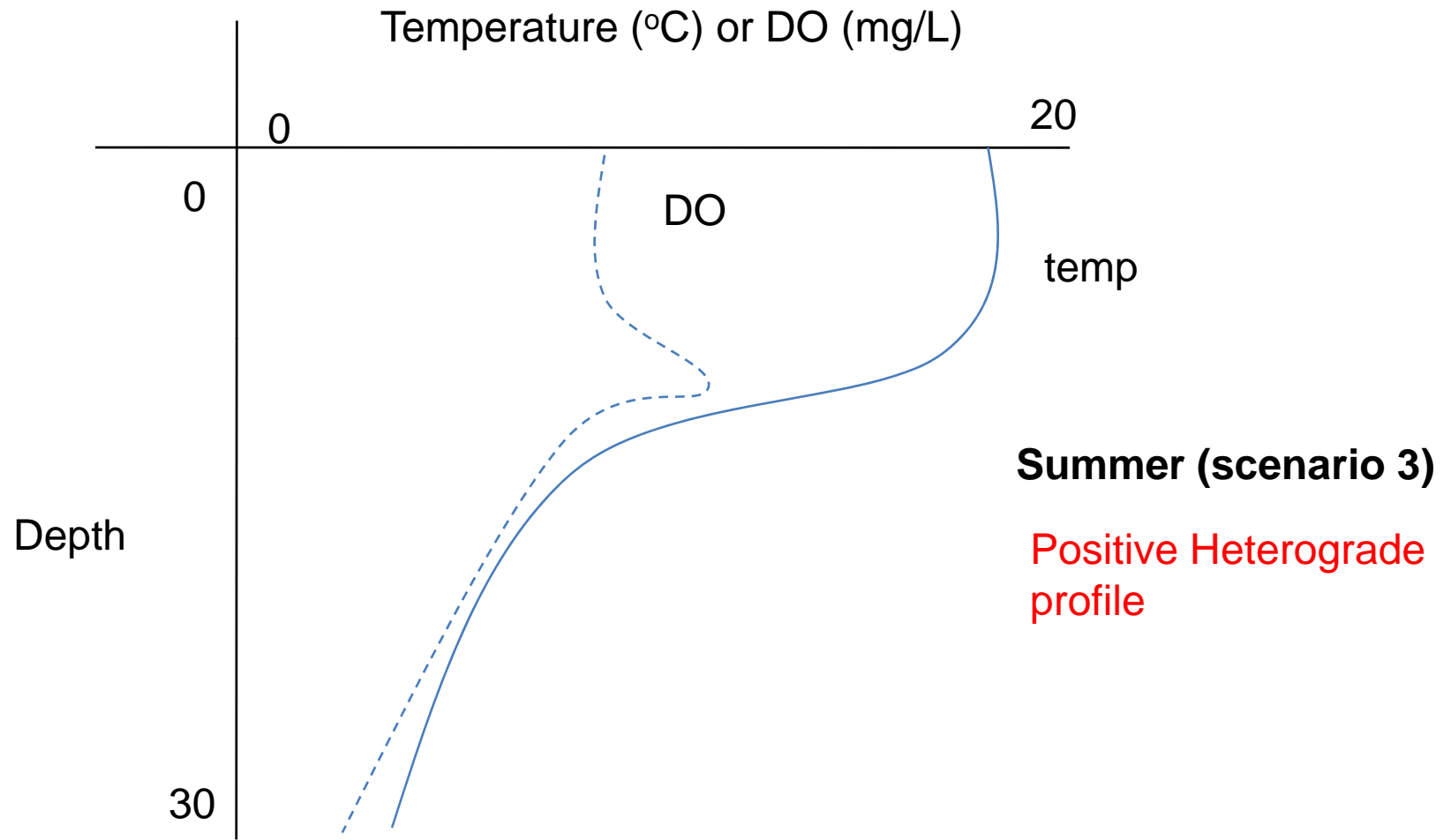
# Dissolved Oxygen

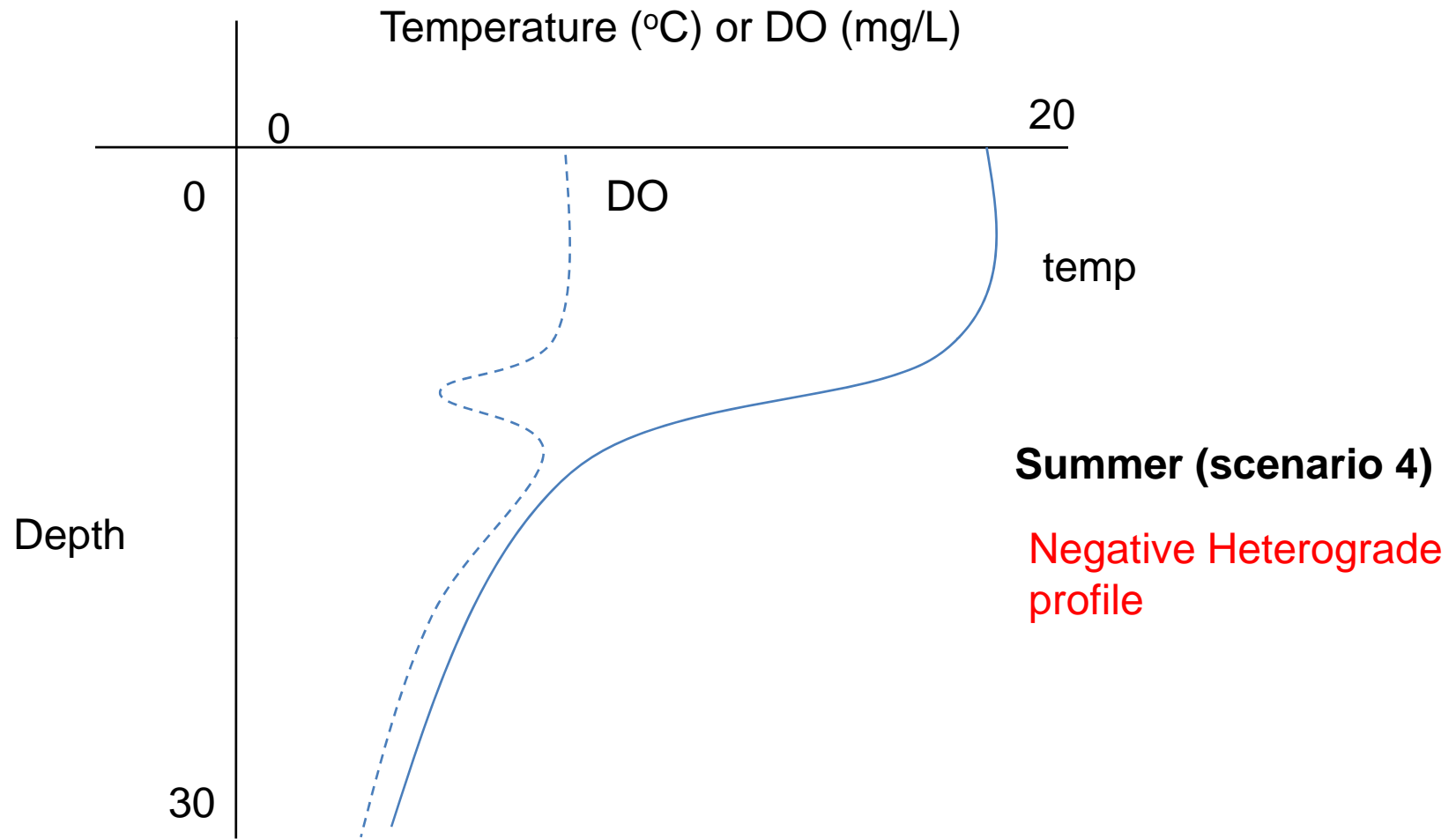
- Solubility increases
  - in cold water
  - at high pressure (deep water)
- Varies with seasonal productivity

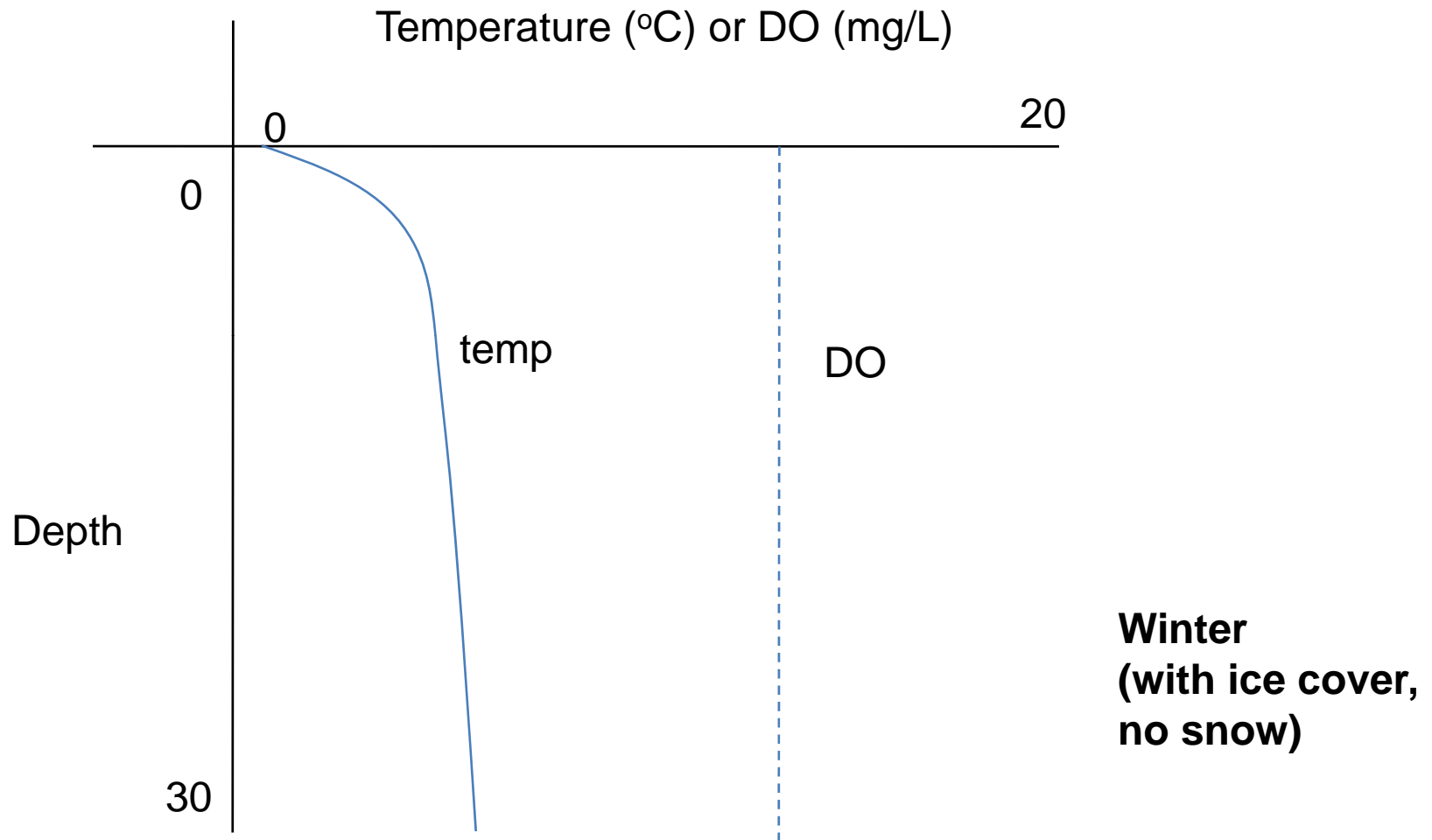


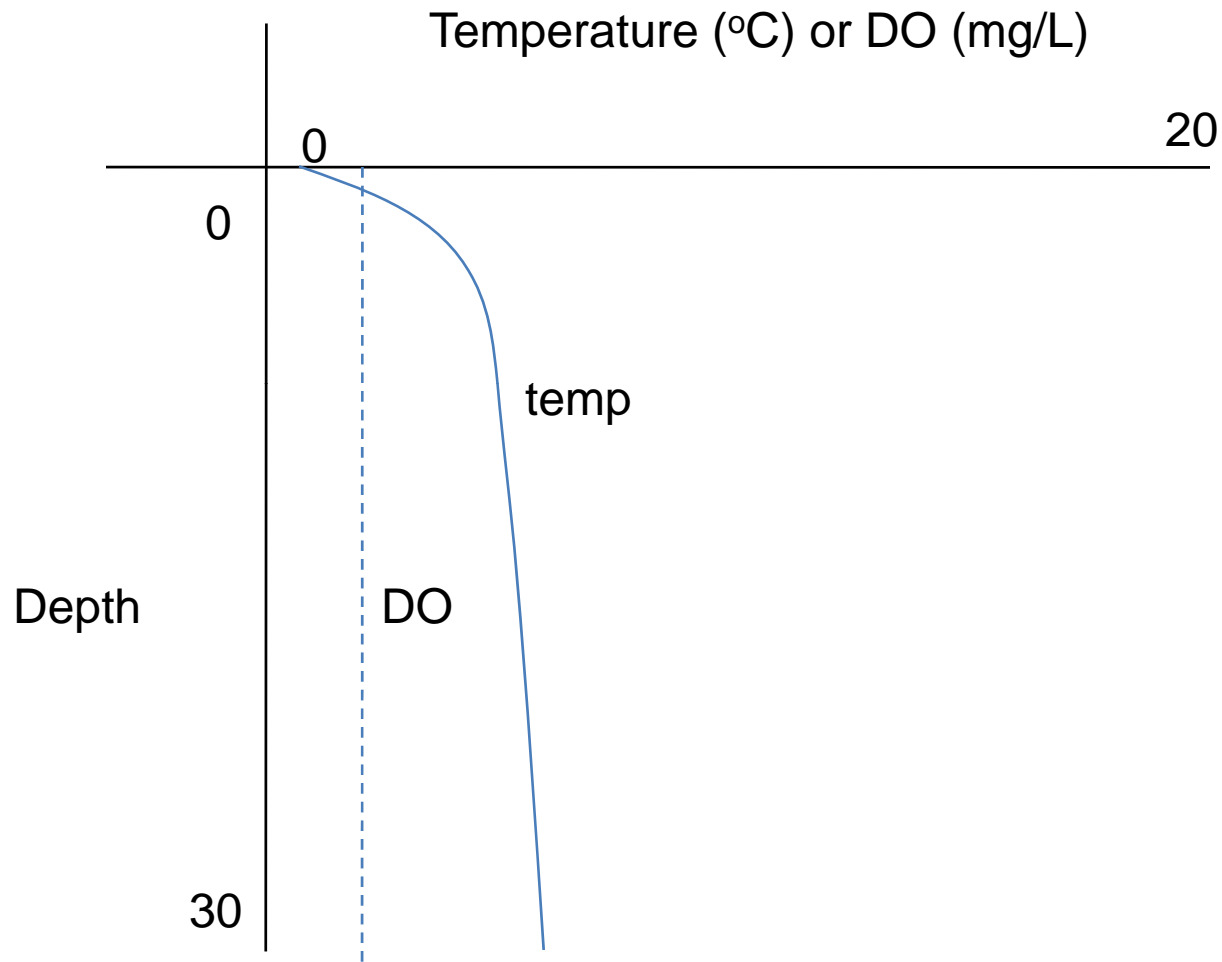












**Winter  
(with ice cover,  
plus snow)**

# Biological Implications of DO

- DO affects distributions of organisms
- Plankton and microbial assemblage use most oxygen (not fish)
- Oxygen depletion increases with eutrophication