

THE SCIENCE OF PHOSPHORUS

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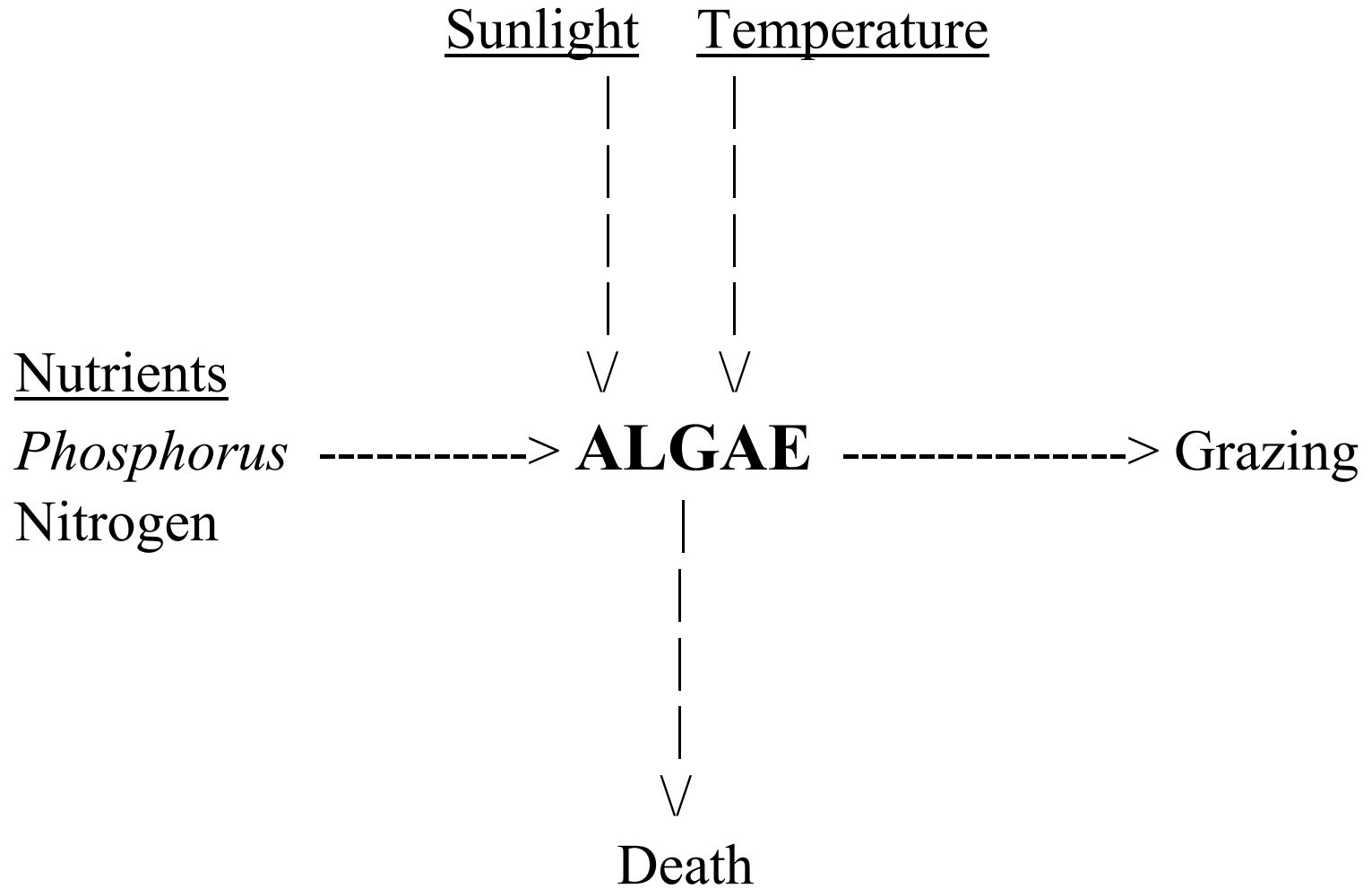
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EUTROPHICATION

The excessive addition of nutrients to a water body resulting in:

- Excessive plant growth (blooms)
- Hypolimnetic loss of dissolved oxygen (*hypoxia*)
- Loss of species diversity
- Tastes and odors

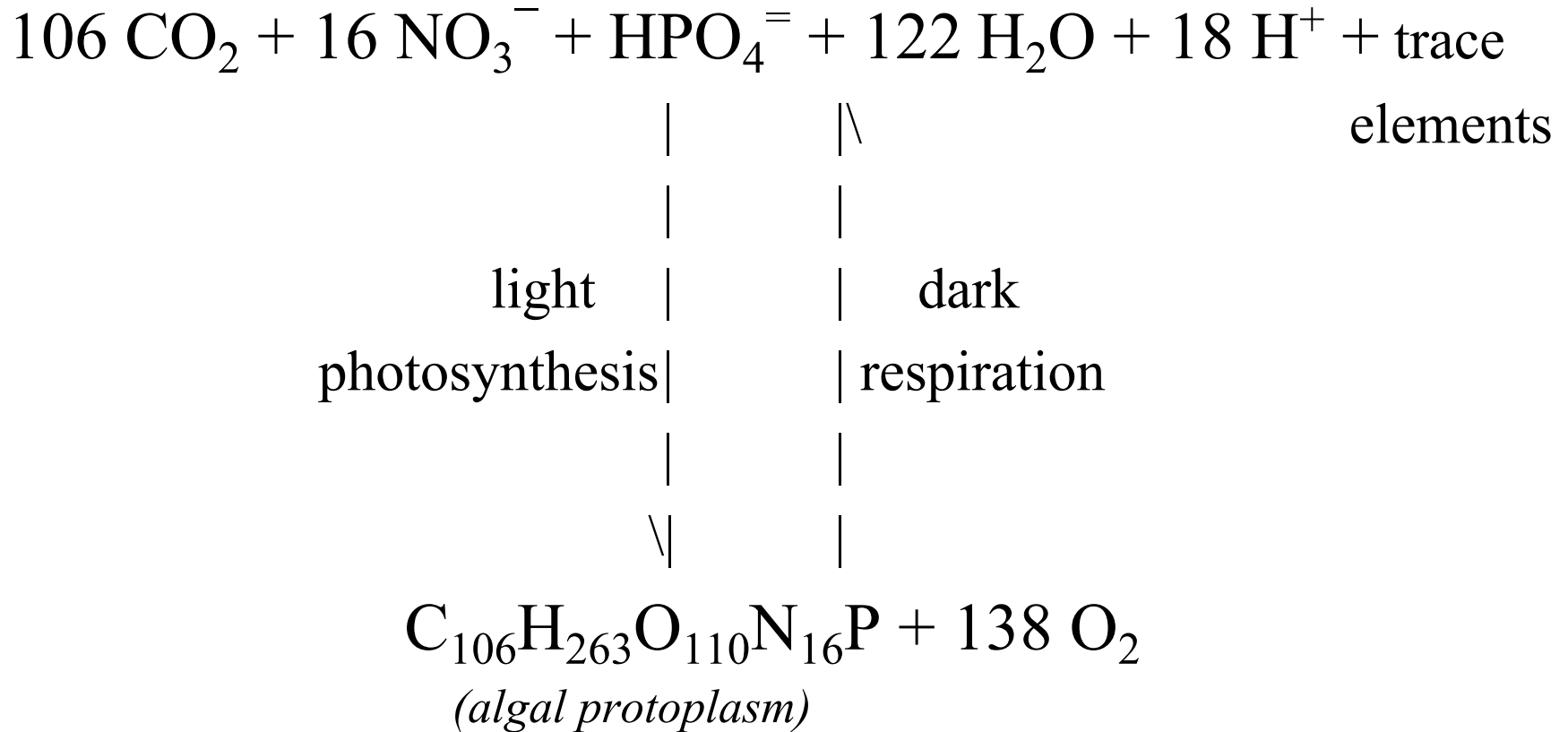
Schematic



Primary Productivity

is the process where CO₂ and nutrients are converted to plant protoplasm

STOICHIOMETRY



TROPHIC STATE OF WATERBODY

- Oligotrophic - low nutrient, low productivity
- Mesotrophic - moderate nutrient & productivity
- Eutrophic - high nutrient, high productivity

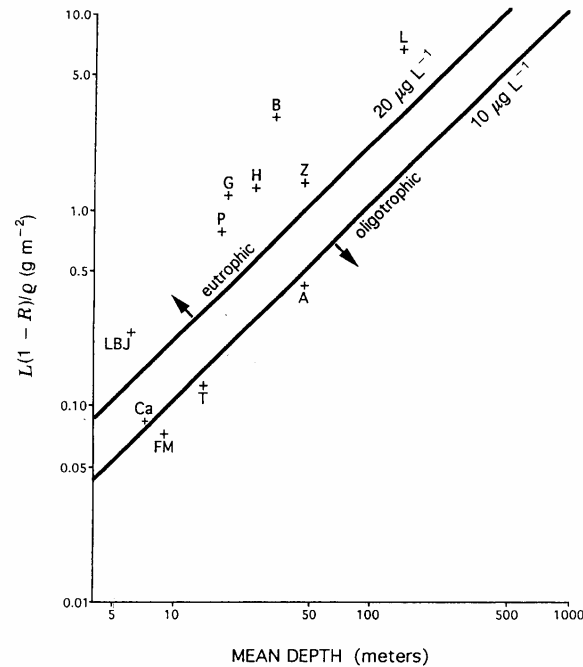
Vollenweider (1968), based on empirical findings,
introduced the concept of

“Areal Loading” of phosphorus (TP)

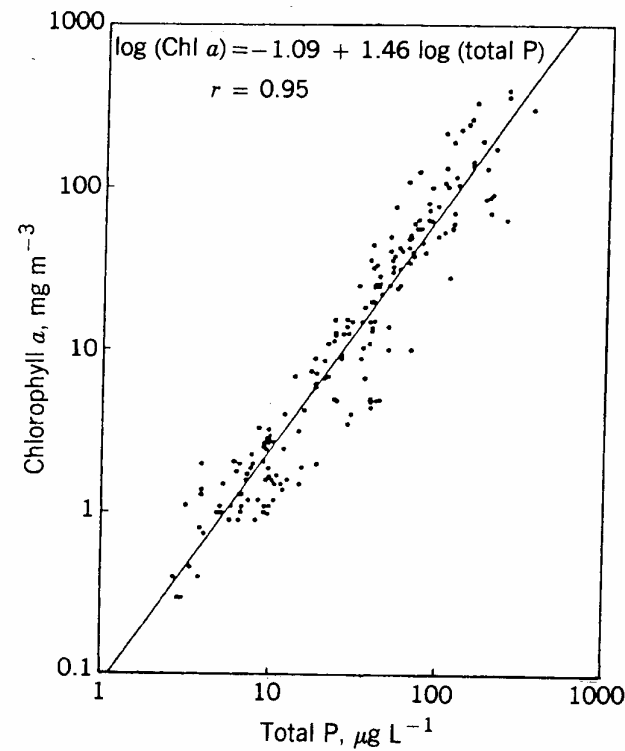
as the critical factor determining the trophic state of
lakes

Phosphorus Loading and Classification

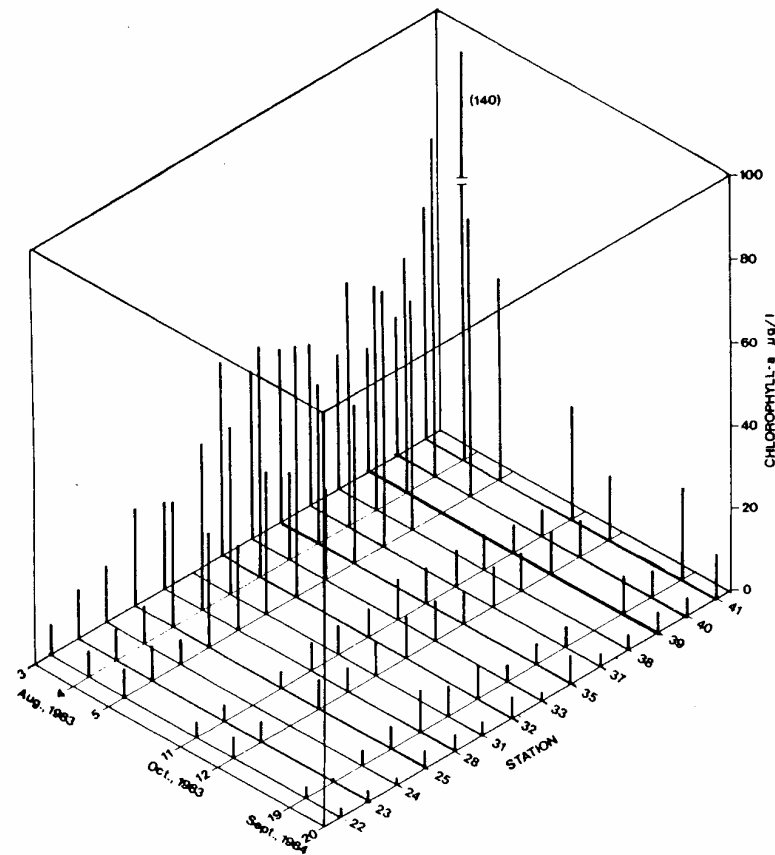
(from Dillon & Rigler, 1974)



Relationship between algal biomass (Chlorophyll-a) production and TP (from Sakamoto, 1979)



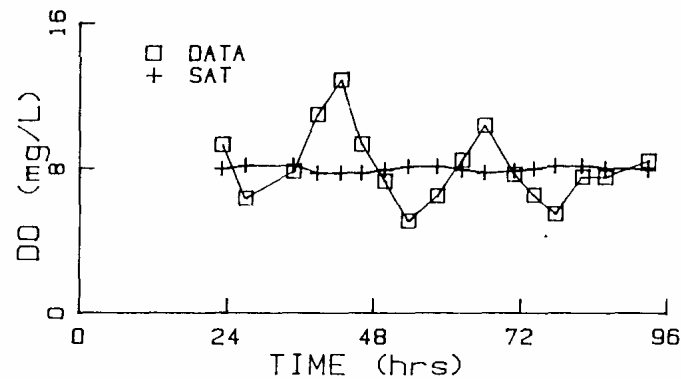
Plot of Chlorophyll-a in Passaic R (from Uchrin, et al., 1988)



TROPHIC STATE BASED ON TP, Chl-a AND SECCHI DEPTH (from Rechow & Chapra, 1977)

TROPHIC <u>STATE</u>	TP <u>($\mu\text{g/L}$)</u>	Chl-a <u>($\mu\text{g/L}$)</u>	SECCHI <u>DEPTH (m)</u>
OLIGO- TROPIC	<10	<7	>3.7
MESO- TROPIC	10-20	7-12	2.0-3.7
EUTROPHIC	>20	>12	<2.0

Plot of Diurnal DO in Passaic S-40 (from Uchrin, et al., 1988)



Diurnal DO at S-40 (0 hrs = midnight 8/2/83).

Plot of DO vs Chl-a Correlation

slope = 0.307 mg-DO/ μ g-Chl-a, intercept = 0.38 mg-DO/L,
 $r^2 = 0.765$ (from Uchrin, et al., 1988)

