

# WATENV – Water, Soil and Vegetation

## Lecture 6

### 7. Pollution and autopurification of streams

Apart from natural substance inputs and the successive enrichments of nutrients, organic nutrients additionally enter the water

- This punctually happens by direct input of insufficiently treated wastewater or diffusely by indirect groundwater inflows, by surface runoff or by aerial transport
- Untreated wastewater and mercury-contaminated mud are still being dumped untreatedly into rivers by the chloro-alkali industries in India
- In many countries, wastewater is dumped untreatedly into rivers. The Yellow River in China gets red: close to Lanzhou, a wastewater canal enters the river
- In contrast to limnic systems, almost all streams have a distinct autopurification ability

In certain amounts, even pollutants can be degraded or transported away by currents:

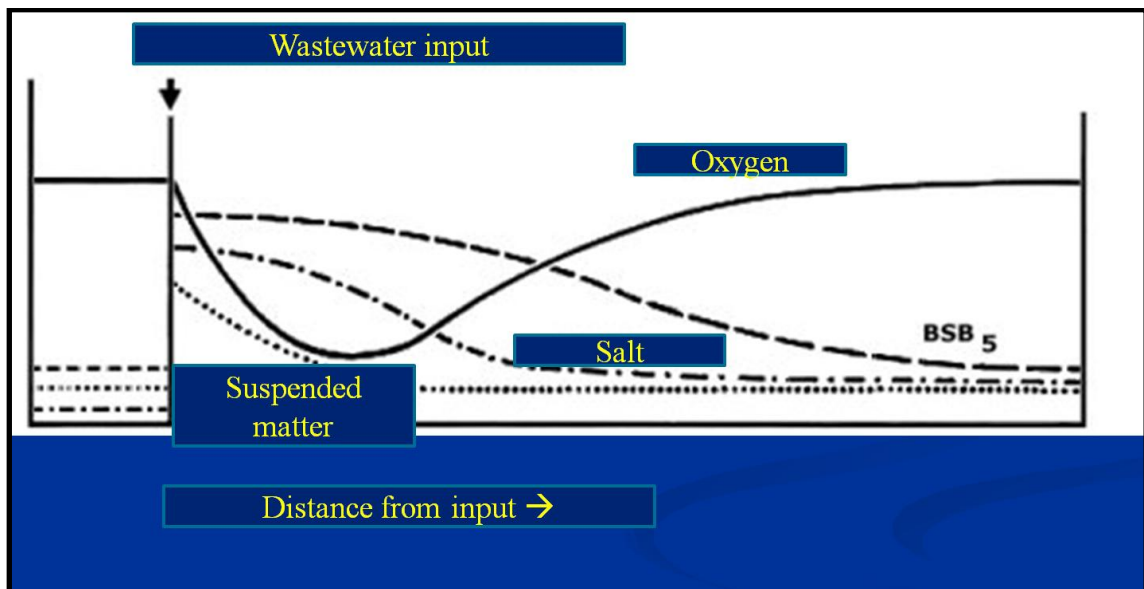


Figure 1: Levels of suspended matter, salt and oxygen

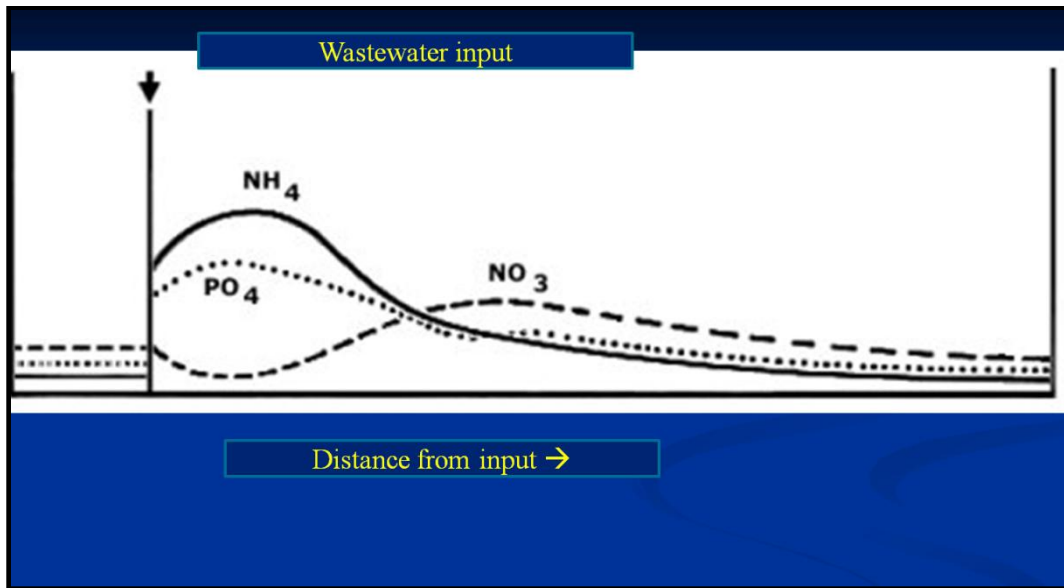


Figure 2: Levels of  $\text{NH}_4$ ,  $\text{PO}_4$  and  $\text{NO}_3$

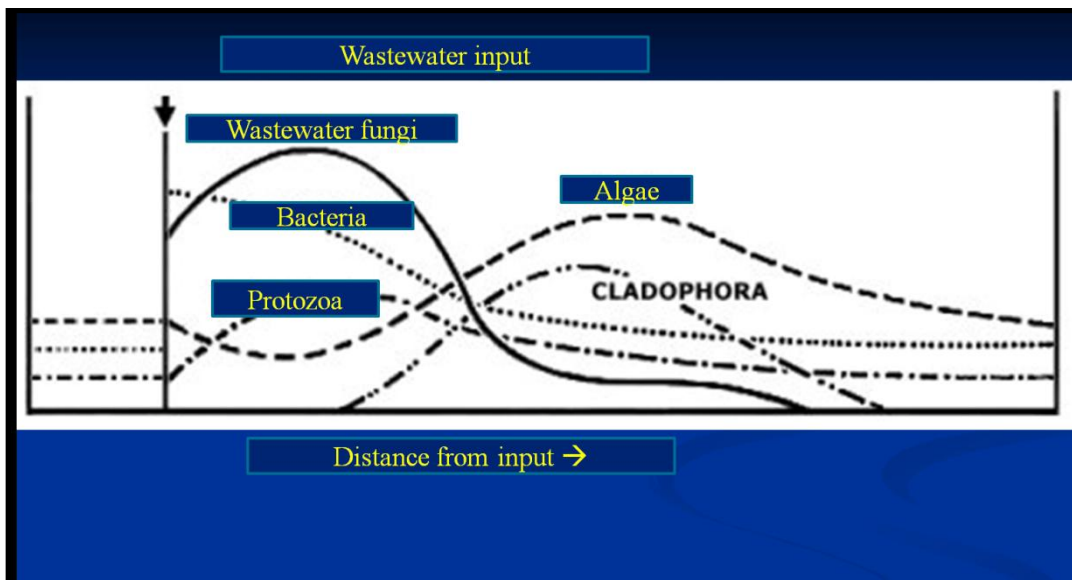


Figure 3: Quantities of wastewater fungi, bacteria, algae, protozoa and cladophora

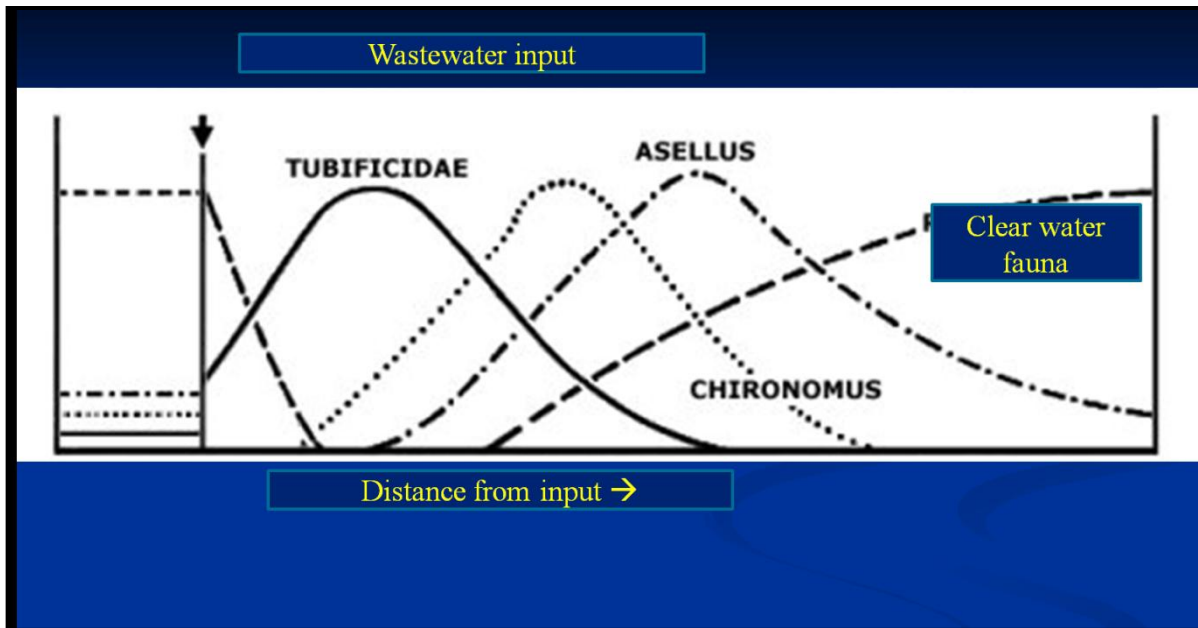


Figure 4: Quantities of Tubificidae, Asellus, Chironomus and clear water fauna

- The saprobity index, already introduced in 1908 by Kolkwitz, and later expanded to the saprobity categories serves for the classification of pollutions and autopurification of streams based upon indicator organisms
- **Quality class 1 – Oligosaprobe:** Unpolluted; high oxygen level, low nutrient concentration, easily degradable organic substances, production and degradation in dynamic balance, species-rich habitats
- **Quality class 2: Beta-mesosaprobe:** Polluted; strong daytime-depending variation of oxygen levels, but no anaerobic conditions; smaller number of bacteria due to lesser organic matter, still quite species-rich habitats
- **Quality class 3 – Alpha-mesosaprobe:** Strongly polluted; reduction of organic matter, Fermentation gases
- **Quality class 4 – Polysaprobe:** Strong pollution by input of organic wastewater, small to zero oxygen levels; oxygen-consuming as well as anaerobic processes; **toxic fermentation gases**
- Colony of the aerobic sulfur bacteria *Beggiatoa alba*: often on top of sapropel in slowly moving waters