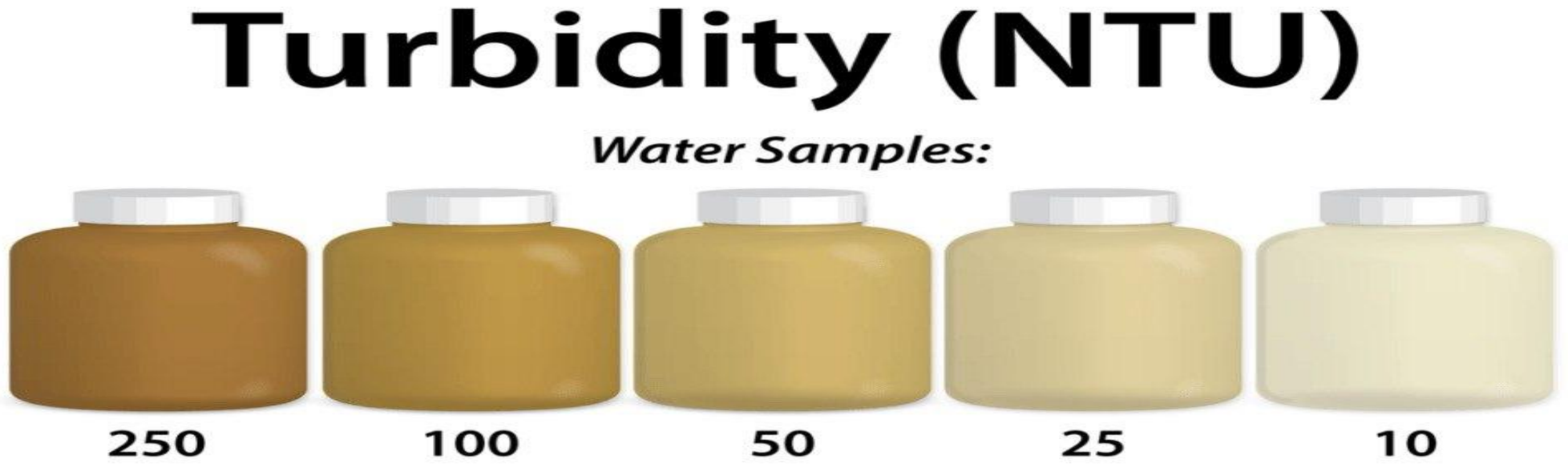
Turbidity of Water

إعداد
م.م.رنا فلاح جميل



Definition of Turbidity

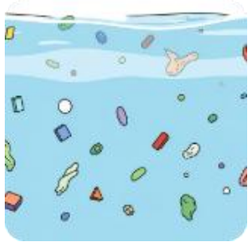


Turbidity is the cloudiness or haziness of water caused by suspended particles.

These particles may include:

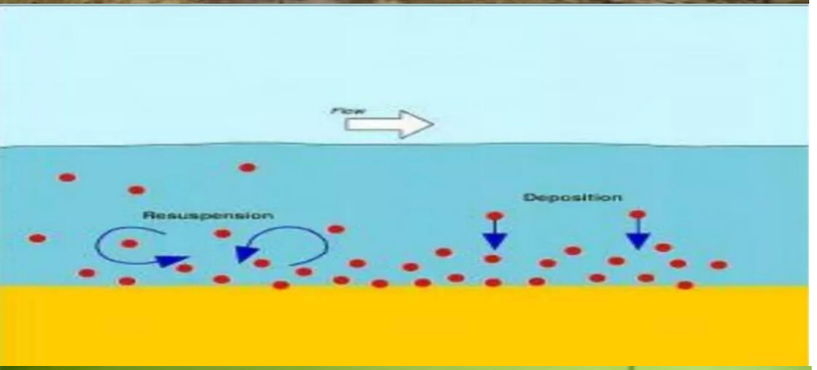
- Sand
- Clay
- Silt
- Organic matter
- Microorganisms (bacteria, algae)





Turbidity is an optical property of water that results from the scattering and absorption of light by suspended materials instead of light passing straight through.









Causes of Turbidity

Soil Erosion & Runoff

Heavy rainfall often washes soil and sediment from land into rivers, lakes, and other water bodies.

Sediment Particles

Fine particles like sand, clay, and silt remain suspended in the water, contributing significantly to its cloudiness.

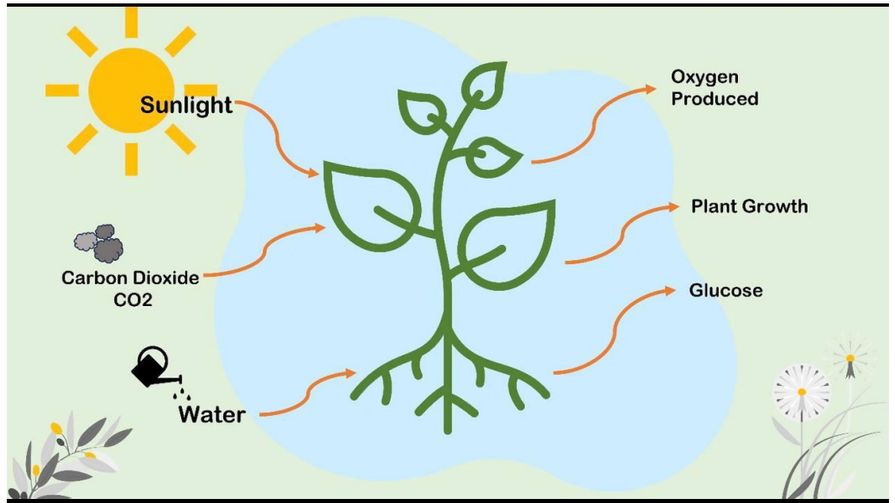
Organic Matter & Algae

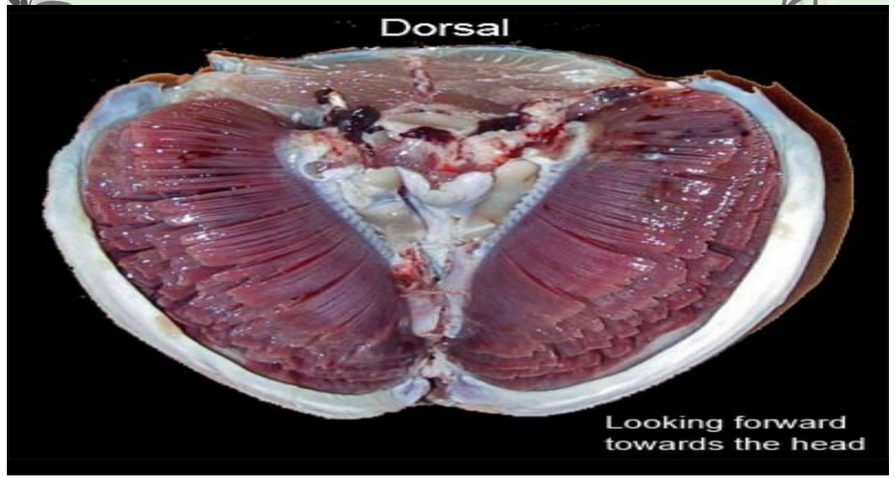
Decomposing plant and animal matter, as well as algal blooms, can also increase turbidity.

waste discharge

Untreated industrial waste and municipal wastewater discharges introduce a variety of suspended solids.

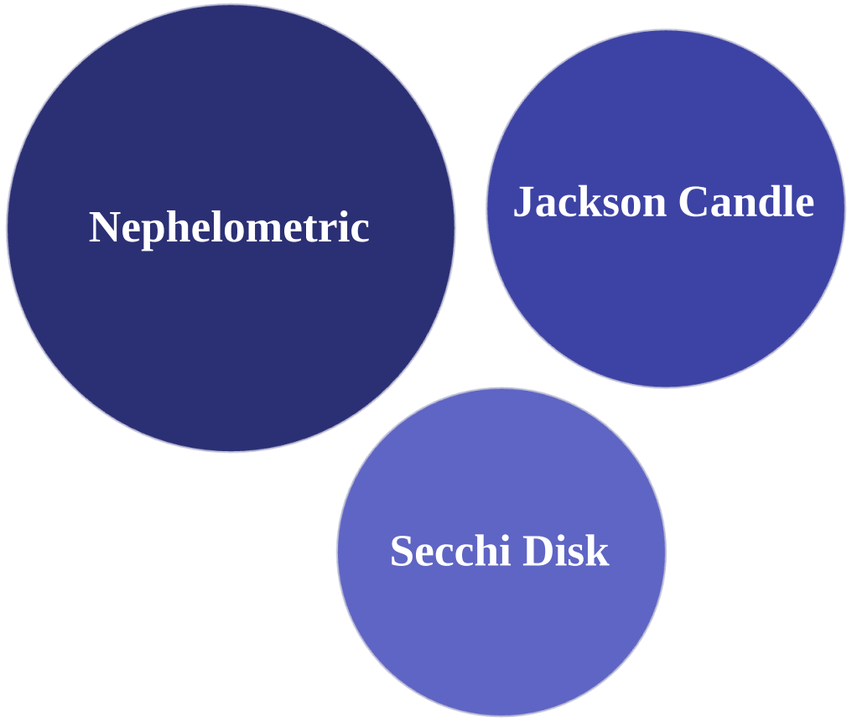
Effects of Turbidity





- Reduces light penetration in water
- Affects photosynthesis of aquatic plants
- Decreases oxygen production
- May clog fish gills (>200 mg/L)
- Indicates possible bacterial contamination

Methods of Measuring Turbidity



Each method employs a distinct approach to quantify the clarity or cloudiness of water, offering varying levels of precision and applicability.

Nephelometric Method

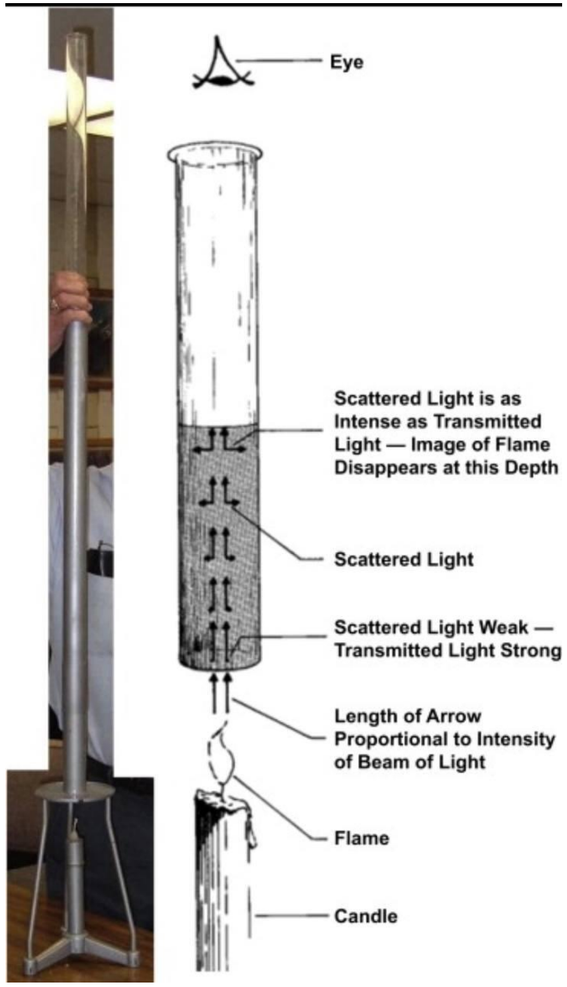
Advanced Measurement

- Utilizes a Nephelometer device.
- Measures the intensity of light scattered by particles at a 90° angle from the incident light beam.
- Offers high accuracy and sensitivity, especially for low turbidity levels (as low as 0.02 NTU).
- Results are expressed in NTU (Nephelometric Turbidity Units), the standard for drinking water.





Jackson Method



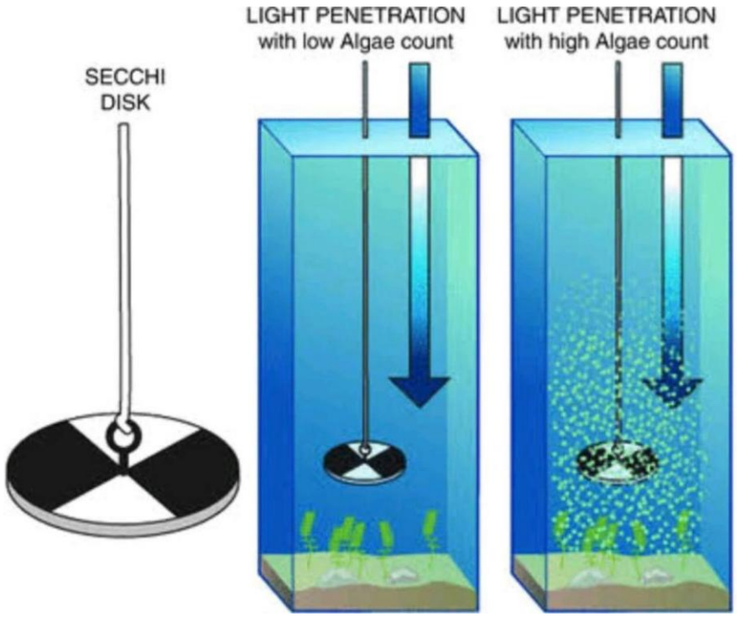
Historical Technique

- Uses a Jackson candle turbidimeter, involving a candle and a graduated glass tube.
- Measures turbidity by observing the disappearance of the candle flame image when viewed through a column of water.
- Suitable for higher turbidity ranges, from 25–1000 units.
- less accurate than modern Nephelometric methods due to subjective human observation.
- Results are given in JTU (Jackson Turbidity Units).

Secchi Disk Method

Field-Based Assessment

- Primarily used in larger water bodies like lakes and reservoirs.
- Involves a 30 cm disk with alternating black and white quadrants.
- The disk is dropped into the water until it is no longer visible, and the depth is recorded.
- Provides a simple measure of water transparency and light penetration depth, crucial for studying aquatic ecology.



Units of Turbidity

NTU (Nephelometric Turbidity Unit)

The most common and precise unit, used with Nephelometers. Recommended for drinking water, typically below 5 NTU.

JTU (Jackson Turbidity Unit)

Historically used with the Jackson Method, providing a less precise but effective measure for very cloudy waters.

Regulatory Standards

For safe drinking water, turbidity levels are usually regulated to be less than 5 NTU, often ideally below 1 NTU.

Interferences in Measurement

Accurate turbidity readings can be compromised by several factors.

1. **Air Bubbles**
2. **Dirty Glassware**
3. **Vibrations**
4. **Colored Dissolved Substances**
5. **Rapid Settling of Coarse Particles**