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| **Factor of Water Quality**: Macronutrients- Nitrates, Phosphates, and Ammonia |
| **Definition**: Nutrients are the key essential source of energy for an aquatic ecosystem |
| **Why it’s important**:Nitrates- building blocks for amino acids (enzymes), proteins, and nucleic acids (DNA and RNA)Phosphates- major component of cell membranes and nucleic acidsAmmonia- comes from decomposition and animal waste; high concentrations can kill organisms |
| **Parameters**: [The healthy limits of a factor]Nitrates: less than 10mg/LPhosphates: less than 0.1mg/LAmmonia: less than 0.05mg/L |
| **Inputs**:DecompositionRaw Sewage Industrial effluence [industrial runoff]Agricultural (livestock) runoff | **Outputs**:Aquatic plantsHigh flowFilter feeders |
| **Measurement**:Nutrient probes |

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| **Factor of Water Quality**: Aquatic Macroinvertebrates |
| **Definition**: Organisms with no backbone that are large enough to be seen with the naked eye (larger than 1/2mm) |
| **Why it’s important**: -Filter the water-Consume algae and excess nutrients-Major food source for the aquatic ecosystem |
| **Parameters**:Pollution Tolerance Index Scores:>40 – Excellent quality40-20- Fair quality <20 – Poor quality |
| **Inputs**:High water quality = High diversity of macros | **Outputs**: Poor habitatPredationContaminants |
| **Measurement**:Macroinvertebrates get collected, identified, categorized, and scored using the Pollution Tolerance Index |
| **Factor of Water Quality**: Dissolved Oxygen, Temperature, and Flow |
| **Definition**: Dissolved oxygen is the measure of oxygen available to organisms in the water; Temperature is a measure of heat energy; Flow measures how fast a certain amount of water is moving |
| **Why it’s important**: Flow and Temperature are important because they have a direct impact on the amount of dissolved oxygen. Dissolved oxygen is crucial for the survival of aquatic life as it is a necessary component of Cellular Respiration and Decomposition.  |
| **Parameters**:Dissolved Oxygen: at least 6.0mg/L (75% saturation at the least)Temperature: No higher than 68 deg. F (20 deg. C)Flow: variable; needs to be moving |
| **Inputs**:-Photosynthesis-Diffusion from air-Flowing, turbulent water | **Outputs**:-Cellular Respiration-Decomposition-Slow/still water-Warmer temperatures |
| **Measurement**:Dissolved Oxygen: DO probe, mg/LTemperature: Temp probe, deg. Fahrenheit or CelsiusFlow: m/s (velocity) or m3/s (volume) |

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| **Factor of Water Quality**: Turbidity |
| **Definition**: A measure of solids suspended in water; turbidity causes the water to look “cloudy” or “murky” |
| **Why it’s important**:-Turbidity can impede navigation (ability to see)-Damages organisms’ respiratory systems-Can cause sediment build-up which will slow/stop flow-Blocks light penetration, inhibiting plant growth |
| **Parameters**:For a forested, northern stream, turbidity should be almost 0 |
| **Inputs**:-Erosion-Algal blooms-Agricultural runoff | **Outputs**:-Settling pools (where water slows down and solids fall out of suspension) |
| **Measurement**: Turbidity tube, Secchi disk |

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| **Factor of Water Quality**: Algae and Solar Radiation |
| **Definition**: Algae is a collection of single-celled aquatic plants that grow in colonies; Algal blooms (overgrowth of algae) looks like thick cotton fiber in the water. Solar radiation is a measure of the UV energy from the sun. |
| **Why it’s important**: Solar radiation is important because it provides the energy necessary for aquatic producers, such as algae, to conduct photosynthesis. Too much radiation can warm the water, causing dissolved oxygen depletion. Algae is important because it is a foundational food source for aquatic ecosystems. It also absorbs excess nutrients out of the water. Excessive algae growth can cause toxicity in the water and can deplete dissolved oxygen, causing a massive fish kill. |
| **Parameters**: If algae impedes visibility, it can cause problems and indicate poor water conditions.For a forested northern stream, solar radiation should be filtered, at most. |
| **Inputs**:Deforestation can lead to excessive solar radiationAlgae blooms can be caused by an influx of nutrients from industrial and/or agricultural runoffLack of riparian (stream-side) vegetation can allow excess nutrients in the waterLow/blocked flow allows algae to bloom | **Outputs**:Forest canopy minimizes solar radiationHigh water flowFilter feeders |
| **Measurement**:Turbidity sensorChlorophyll light sensor |

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| **Factor of Water Quality**: Micronutrient- Salinity/Conductivity |
| **Definition**: A measure of dissolved salt in the water |
| **Why it’s important**: Salt in necessary for the necessary for the functioning of muscles and the nervous system, but too much in a freshwater system can kill all the life. |
| **Parameters**: Less than 1 Siemen/cm (S/cm) |
| **Inputs**:Road salt Soil composition/erosionIndustrial and/or agricultural runoff | **Outputs**:High flowConsumption by organisms |
| **Measurement**: Conductivity probe, S/cm |
| **Factor of Water Quality**: pH |
| See the source image**Definition**: A measure of how acidic or alkaline a substance is |
| **Why it’s important**: Freshwater ecosystems typically require a pH of close to neutral. pH measuring too high or too low can lead to stress, sickness, and eventual death of most aquatic life. A low pH (acidic system) can also make toxins, like mercury, more toxic. |
| **Parameters**: 6.5 - 8.3 |
| **Influences of pH**:Soil composition/erosionIndustrial/mining effluence | Photosynthesis/Cellular Respiration (CO2)Acid precipitationAmmonia-based fertilizers |
| **Measurement**: pH Meter Electrode |

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| **Factor of Water Quality**: Fecal Coliform Bacteria |
| **Definition**: A class of bacteria (such as *E. coli* and *Streptococcus sp.*) that originates in the intestines of warm-blooded organisms and is found in feces. 90% of fecal coliforms are *E. coli.* |
| **Why it’s important**: Fecal coliforms are important for proper digestion within the gut of organisms. While, they, themselves, are not typically dangerous, they can indicate the presence of other more harmful pathogens. Additionally, high concentrations of bacteria can deplete the supply of dissolved oxygen, which would be detrimental for an ecosystem. |
| **Parameters**: No more than 20 organisms/100mL |
| **Inputs**:Raw sewageAnimal waste (especially from dogs)Agricultural (livestock) runoffWarmer water temperaturesLow/blocked flow | **Outputs**:Filter feedersHigh flowCool waterVegetative bufferAdequate wastewater treatmentPicking up pet waste |
| **Measurement**: Colony/organism count; Positive/Negative color test |