Water characteristics and quality:

- Physical characteristics
- Chemical characteristics
- Biological characteristics

Physical characteristics

Turbidity

- the clarity of water Transparency of natural water bodies is affected by human activity, decaying plant matter, algal blooms, suspended sediments, and plant nutrients
- Turbidity provides an inexpensive estimate of total suspended solids
- TSS concentration Turbidity has little meaning except in relatively clear waters but is useful in defining drinking-water quality in water treatment measures how deep a person can see into the water

- Total Solids (TS) - the total of all solids in a water sample

- Total Suspended Solids (TSS) - the amount of filterable solids in a water sample, filters are dried and weighed
- Total Dissolved Solids (TDS) - Non filterable solids that pass through a filter with a pore size of 2.0 micron, after filtration the liquid is dried and residue is weighed EPA Secondary Drinking Water Recommendation is for TDS of less than 500mg/L
- Volatile Solids (VS) - Volatile solids are those solids lost on heating to 500 degrees C - rough approximation of the amount of organic matter present in the solid fraction of wastewater

Chemical Characteristics

- Commonly measured chemical parameters are:
    - pH
    - Alkalinity
    - Hardness
    - Nitrates, Nitrites, & Ammonia
    - 'Phosphates
    - 'Dissolved Oxygen & Biochemical Oxygen Demand

pH:

The pH of water determines the solubility of many ions and biological availability of chemical constituents such as nutrients (phosphorus, nitrogen, and carbon) an heavy metals (lead, copper, cadmium)

Hardness

- Hard water is found in about 85% of USA.
- Prevents lathering/sudsing - hotter water and extra rinse cycles may be required
- Fabric appearance declines & life may be reduced
- Minerals may clog pipes & cause excessive wear on moving parts

Solutions:

- Distill water to remove the calcium and magnesium
- Soften the Water - Replaces calcium and magnesium ions with sodium or potassium ions

Maximum Contaminant Level (MCL):

- nitrite-N : 1 mg/L
- nitrate-N : 10 mg/L
- nitrite + nitrate (as N) : 10 mg/L

Sources:

Fertilized areas; Sewage disposal; Feed lots; N cycle

PHOSPHATES

- Secondary Drinking Water Standard EPA recommendation
- total phosphate should be <0.05 mg/L (as phosphorus) in a stream where it enters a lake or reservoir

- total phosphate should not exceed 0.1 mg/L in streams that do not discharge directly into lakes or reservoirs

Sources:

Erosion; Fertilizer; Sewage; Feed lots; Detergents

Dissolved Oxygen

- Dissolved Oxygen DO mg/L - only gas routinely measured in water samples (depends on temperature, salinity, and pressure)

- Analysis should be performed on site immediately after sampling

- Oxygen enters the water by photosynthesis of aquatic biota transfer across the air-water interface

- DO < 5mg/L stresses aquatic life (the lower the concentration, the greater the stress)

Biological Characteristics

- Harmless bacteria ~ present in large numbers
- in feces and intestinal tracts of humans and
- other warm-blooded animals

Environmental Impact

- indicator of contamination with human or animal fecal material
- may indicate contamination by pathogens or disease producing
- bacteria or viruses

Criteria

- Swimming ~ fewer than 200 colonies/100 mL
- Fishing and boating ~ fewer than 1000 colonies/100 mL
- Domestic water supply ~ fewer than 2000 colonies/100 mL
- Drinking water 0 colonies/100mL

Biological Oxygen Demand

- Biological Oxygen Demand is a measure of oxygen used by microorganisms to decompose organic waste (add a microorganism seed to all samples seal sample dead plants, leaves, samples, from air, store in dark to prevent photosynthesis, subtract seeded control, measure decrease in DO)
- Nitrates & phosphates are plant
- nutrients so may contribute to high
- BOD levels When BOD levels are high, dissolved
- oxygen decreases - fish and other grass clippings, manure, sewage, or food waste aquatic organisms may not survive

An index of the degree of organic pollution in water

BOD level of 1-2 ppm - very good
BOD level of 3-5 ppm - moderately clean BOD level of 6-9 ppm - somewhat polluted