

ENVIRONMENTAL TECHNICAL NOTE

DEFINITIONS OF SOME TERMS COMMONLY USED IN WATER QUALITY MANAGEMENT, POLLUTION CONTROL AND ABATEMENT

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Water quality is inherent in the program responsibilities, objectives and policies of the Natural Resources Conservation Service. Involvement in this work has made it necessary for Service personnel to understand the meaning and proper use of the technical terminology used in water quality management, pollution control, and abatement programs.

The following list of terms and definitions has been compiled from data published by the U. S. Environmental Protection Agency, Council on Environmental Quality, U. S. Department of Agriculture, U. S. Department of Interior, and Public Laws of the United States, and the State of Montana. This list developed as Nevada TN – EVT NV-8, April 1975, has been revised and supplemented for Montana distribution.

A

Acclimatization

The physiological adjustment or adaptation by an organism to new physical and/or environmental conditions. With respect to water, it is frequently used in reference to the ability of a species to tolerate changes in water temperature, degradation of water quality, or increased levels of salinity.

Acid

- (1) Chemicals that release hydrogen ions (H⁺) in solution and produce hydronium ions (H₃O⁺). Such solutions have a sour taste, neutralize bases, and conduct electricity.
- (2) Term applied to water with a pH of less than 7.0 on a pH scale of 0 to 14.

Acid Mine Drainage (AMD)

Acidic water that flows into streams from abandoned mines or piles of mining waste or tailings. The acid arises from the oxidation of iron sulfide compounds in the mines by air, dissolved oxygen in the water, and chemoautotrophs, which are bacteria that can use the iron sulfide as an energy source. Iron sulfide oxidation products include sulfuric acid, the presence of which has reduced or eliminated aquatic life in many streams in mining regions. Also referred to as Acid Mine Waste.

Acid Rain

Rainfall with a pH of less than 7.0. One of the principle sources is the combining of rain (H₂O) and sulfur dioxide (SO₂), nitrous oxides (N₂), and carbon dioxide (CO₂) emissions which are byproducts of the combustion of fossil fuels. These oxides react with the water to form sulfuric (H₂SO₄), nitric (HNO₃), and carbonic acids (H₂CO₃). Long-term deposition of these acids is linked to adverse effects on aquatic organisms and plant life in areas with poor neutralizing (buffering) capacity.

Acre-Foot (AF)

A unit commonly used for measuring the volume of water; equal to the quantity of water required to cover one acre (43,560 square feet or 4,047 square meters) to a depth of 1 foot (0.30 meter) and equal to 43,560 cubic feet (1,234 cubic meters), or 325,851 gallons.

Acre-Inch

The volume of water or solids that will cover one acre to a depth of one inch, equivalent to 3,630 cubic feet or 102.7 cubic meters.

Activated-Sludge Process

See secondary treatment.

Acute

Designates an exposure to a dangerous substance or chemical in sufficient dosage to precipitate a severe reaction. Acute Exposure refers to such dosage levels received over a period of 24 hours or less. Longer-term exposures are referred to as Chronic Exposure.

Adaptive Management

A process for implementing policy decisions as an ongoing activity that requires monitoring and adjustment. Adaptive management applies scientific principles and methods to improve resource management incrementally as managers learn from experience and as new scientific findings and social changes demand.

Adhesion

Molecular attraction that holds the surfaces of two substances in contact, such as water and rock particles. Also, the attraction of water molecules to other materials as a result of hydrogen bonding.

Adsorption

The adhesion of a substance to the surface of a solid or liquid. Adsorption is often used to extract pollutants by causing them to be attached to adsorbents such as activated carbon or silica gel. Some adsorbents are used to extract oil from waterways in oil spills.

Advanced Treatment

Various processes used in addition to secondary treatment, including coagulation-sedimentation or electro-dialysis, and adsorption.

Aerated Lagoon (Mechanically Aerated Lagoon)

A basin designed for the treatment of sewages or other wastewater in which oxygen is furnished by means of a mechanism which "beats" or blows air into the water with a portion of the oxygen dissolved. The lagoon is therefore not dependent on the wind or algae growth for the oxygen supply. The reactions that take place in an aerated lagoon are similar to those in the oxidation ditch.

Aerobic Lagoon

A disposal lagoon designed and operated to maintain dissolved oxygen in the water at all times. Depending upon the method of aeration aerobic lagoons may be two types: Oxidation ponds (naturally aerated lagoons), and aerated lagoons (mechanically aerated lagoons).

Aerobic Organism

An organism that thrives in the presence of oxygen. Aerobic bacteria which are important in the disposal of organic waste use oxygen as a hydrogen acceptor in biochemical reactions. Contrast with Anaerobic.

Aerobic Treatment

A process used for the removal of biodegradable organic matter which requires oxygen. Aerobic treatment is an essentially odorless process.

Aggradation

- (1) The raising of stream beds or flood plains by deposition of sediment eroded and transported from upstream.
- (2) The buildup of sediments at the headwaters of a lake or reservoir or at a point where streamflow slows to the point that it will drop part or all of its sediment load.
- (3) The building of a flood plain by sediment deposition; the filling of a depression or drainageway with sediment; the building of a fan by deposition of an alluvial mantle.
- (4) Modification of the earth's surface in the direction of uniformity of grade or slope, by Deposition, as in a river bed. Opposite of Degradation.

Agriculture-Related Pollutants

These pollutants of special concern include: sediment, animal wastes, wastes from industrial processing or raw agricultural products, plant nutrients, forest and crop residues, inorganic salts and minerals, pesticides in the environment, and air pollution in relation to agriculture. Additional pollutants related to agriculture which may be added to the above listing include: radiation, infectious agents, toxins, allergens, noise and heat.

Air Pollution

This means the presence in the outdoor atmosphere of one or more containments in such quantities and duration as is or tends to be injurious to human health or welfare, animal or plant life, or property, or would unreasonably interfere with the enjoyment of life or property or conduct of business.

Algae (Alga)

Simple plants, many microscopic, containing chlorophyll. Most algae are aquatic and may produce a nuisance when conditions are suitable for prolific growth.

Algal Bloom

- (1) Rapid growth of algae on the surface of lakes, streams, or ponds; stimulated by nutrient enrichment.
- (2) A heavy growth of algae in and on a body of water as a result of high phosphate concentration such as from farm fertilizers and detergents. It is associated with Eutrophication and results in a deterioration in water quality. Also spelled Algae Bloom.

Alkali

Any strongly basic (high pH) substance capable of neutralizing an acid, such as soda, potash, etc., that is soluble in water and increases the pH of a solution greater than 7.0. Also refers to soluble salts in soil, surface water, or groundwater.

Alkalinity

- (1) Refers to the extent to which water or soils contain soluble mineral salts. Waters with a pH greater than 7.4 are considered alkaline.
- (2) The capacity of water for neutralizing an acid solution. Alkalinity of natural waters is due primarily to the presence of hydroxides, bicarbonates, carbonates and occasionally borates, silicates and phosphates. It is expressed in units of milligrams per liter (mg/l) of CaCO₃ (calcium carbonate). A solution having a pH below 4.5 contains no alkalinity.

Alluvial

- (1) Pertaining to processes or materials associated with transportation or deposition by running water.
- (2) Pertaining to or composed of alluvium, or deposited by a stream or running water.
- (3) An adjective referring to soil or earth material which has been deposited by running water, as in a riverbed, flood plain, or delta.

Ambient Water Quality Standards

The allowable amount of materials, as a concentration of pollutants, in water. The standard is set to protect against anticipated adverse effects on human health or welfare, wildlife, or the environment, with a margin of safety in the case of human health.

Anaerobic Lagoon

A lagoon designed and operated to exclude oxygen. Anaerobic bacteria digest the waste, and gases such as methane, carbon dioxide, and hydrogen sulfide are released. Anaerobic lagoons give off obnoxious odors—particularly if much hydrogen sulfide is produced. Anaerobic lagoons are constructed to have depths greater than five feet.

Anaerobic Organism

An organism that thrives in the absence of oxygen. Anaerobic bacteria which are important in the disposal of animal waste use sulfate and carbon dioxide as hydrogen acceptors in biochemical reactions.

Anaerobic Treatment/Decomposition

The degradation of materials by Anaerobic microorganisms living beneath the ground or in oxygen-depleted water to form reduced compounds such as methane or hydrogen sulfide. Generally a slower process than Aerobic Decomposition.

Annual 7-Day Minimum (USGS)

The lowest mean discharge for 7 consecutive days in a year. Note that most low-flow frequency analyses of annual 7-day minimum flows use a climatic year (i.e., April 1-March 31). The date shown in USGS statistical tables is the initial date of the 7-day period. This value should not be confused with the 7-day, 10-year low-flow statistic.

Anoxic

- (1) Denotes the absence of oxygen, as in a body of water.
- (2) Of, relating to, or affected with anoxia; greatly deficient in oxygen; oxygenless as with water.

Anthropogenic

Involving the impact of human activities on nature; induced, caused, or altered by the presence and activities of humans, as in water and air pollution.

Assimilative Capacity

The ability of air, a natural body of water, or soil to effectively degrade and/or disperse chemical substances. If the rate of introduction of pollutants into the environment exceeds its assimilative capacity for these substances, then adverse effects may result to habitat and wildlife.

Autotrophic Organism

An organism capable of constructing organic matter from inorganic substances.

Avulsion

- (1) The sudden movement of soil from one property to another as a result of a flood or a shift in the course of a boundary stream.
- (2) A forcible separation or detachment; a sudden cutting off of land by flood, currents, or change in course of a body of water; especially one separating land from one person's property and joining it to another's.
- (3) A sudden cutting off or separation of land by a flood or by an abrupt change in the course of a stream, as by a stream breaking through a meander or by a sudden change in current, whereby the stream deserts its old path for a new one.
- (4) A sudden loss or gain of land as the result of action of water or a shift in a bed of a river which has been used as a boundary by property owners.

B

Bacteria (Singular: Bacterium)

- (1) Microscopic one-celled organisms which live everywhere and perform a variety of functions. While decomposing organic matter in water, bacteria can greatly reduce the amount of oxygen in the water. They also can make water unsafe to drink.
- (2) Microscopic unicellular organisms, typically spherical, rod-like, or spiral and threadlike in shape, often clumped into colonies. Some bacteria cause disease, while others perform an essential role in nature in the recycling of materials, for example, decomposing organic matter into a form available for reuse by plants. Some forms of bacteria are used to stabilize organic wastes in wastewater treatment plants, oil spills, or other pollutants. Disease-causing forms of bacteria are termed "pathogenic." Some forms of bacteria harmful to humans include:

Bacterial Plate Count

A system used to quantify the number of bacteria in a sample of solid or liquid material by measuring the growth of bacterium into full colonies.

Bankfull Discharge

See Dominant Discharge.

Bankfull Stage

The stage at which a stream first begins to overflow its natural banks. More precisely, an established river stage at a given location along a river which is intended to represent the maximum safe water level that will not overflow the river banks or cause any significant damage within the river reach. Bankfull stage is a hydraulic term, whereas Flood Stage implies resultant damage.

Base Flow

- (1) The flow that a perennially flowing stream reduces to during the dry season. It is supported by groundwater seepage into the channel.
- (2) The fair-weather or sustained flow of streams; that part of stream discharge not attributable to direct runoff from precipitation, snowmelt, or a spring. Discharge entering streams channels as effluent from the groundwater reservoir.
- (3) The volume of flow in a stream channel that is not derived from surface run-off. Base flow is characterized by low flow regime (frequency, magnitude, and duration daily, seasonally, and yearly), by minimum low-flow events and in context of the size and complexity of the stream and its channel.

Bed Load

- (1) Sediment particles up to rock, which slide and roll along the bottom of the streambed.
- (2) Material in movement along a stream bottom, or, if wind is the moving agent, along the surface.
- (3) The sediment that is transported in a stream by rolling, sliding, or skipping along or very close to the bed. In USGS reports, bed load is considered to consist of particles in transit from the bed to an elevation equal to the top of the bed-load sample nozzle (usually within 0.25 feet of the streambed). Contrast with material carried in Suspension or Solution.

Beneficial Use (of Water)

Montana recognizes the following uses as beneficial:

- [1] Agricultural;
- [2] Aquatic Life (growth and propagation of aquatic life, water fowl and furbearers);
- [3] Cold Water Fishery (growth and propagation of cold water fish);
- [4] Warm Water Fishery (growth and propagation of warm water fish);
- [5] Industrial;
- [6] Drinking Water (drinking, culinary and food processing use after treatment);
- [7] Primary Contact Recreation (bathing, swimming and recreation).

Benthic

- (1) The bottom of lakes or oceans.
- (2) Referring to organisms that live on the bottom of water bodies.

Benthic Invertebrates

Aquatic animals without backbones that dwell on or in the bottom sediments of fresh or salt water. Examples are clams, crayfish, and a wide variety of worms.

Best Available Demonstrated Technology

The technologic basis for establishing effluent limits for new industries under the Federal Water Pollution Control Act Amendments (PL 92-500). Best available demonstrated technology is described as those processes and control technologies that have demonstrated at a pilot plant level that technologically and economically they justify making investments in new plant facilities.

Best Available Technology

The technology required under the Federal Water Pollution Control Act Amendments (PL 92-500) for industry and publicly owned treatment plants to control pollution by July 1, 1983. Best available technology is the highest degree of technology proved to be designable for plant scale operations so that costs for this treatment may be higher than for treatment by best practicable technology. Best available technology takes into account such factors as age of equipment, facilities involved, process employed and process changes, engineering aspects of control techniques, and environment impact apart from water quality, including energy requirements. Publicly owned treatment plants under 92-500 are required to apply "best practicable technology" by July 1, 1983.

Best Practicable Technology

The technology required under the Federal Water Pollution Control Act Amendments (PL 92-500) for industry and publicly owned treatment plants to control water pollution by July 1, 1977. Best practicable technology takes into account such factors as age of equipment, facilities involved, process employed and process changes, engineering aspects of control techniques, and environmental impacts apart from water quality, including energy requirements.

In assessing the best practicable technology for a particular category or industry, a balance is struck between total cost and effluent reduction benefits. Under best practicable technology

publicly owned treatment plants are required to provide a minimum of “secondary treatment” by July 1, 1977.

Bioaccumulation

The increase in concentration of a chemical in organisms that reside in environments contaminated with low concentrations of various organic compounds. Also used to describe the progressive increase in the amount of a chemical in an organism resulting from rates of absorption of a substance in excess of its metabolism and excretion.

Biodegradable

Capable of being decomposed by biological agents or microorganisms, especially bacteria. The property of a substance that permits it to be broken down by micro-organisms into simple, stable compounds such as carbon dioxide and water.

Biological Oxygen Demand (BOD)

The quantitative measure of the amount of oxygen necessary to satisfy the biochemical oxidation requirements of pollutants (organic waste) at the time the sample is collected. Its determination is based on incubation of the sample (water and waste) under aerobic conditions for a specified period of time—five days generally being standard—and measurement of the oxygen consumed. Unless otherwise specified, biological oxygen demand will mean the five-day BOD incubated at 20 degrees C., usually expressed as lbs. BOD per day.

The population effect of BOD is to reduce or deplete dissolved oxygen in waters of streams and lakes. Dissolved oxygen above a certain minimum level must be present in surface waters to support fish and other aquatic life. Septic conditions prevail in water without dissolved oxygen.

Biomass

(1) The total mass of living matter within a given unit of environmental area, typically expressed as mass per unit area or volume of habitat.

(2) Plant material, vegetation, or agricultural waste used as a fuel or energy source. Some methods of determining biomass in a sample include:

[1] **Ash Mass** – The mass or amount of residue present after the residue from the dry mass determination has been ashed in a muffle furnace at a temperature of 500EC for 1 hour. The ash mass values of zooplankton and phytoplankton are expressed in grams per cubic meter (g/m³), and periphyton and benthic organisms in grams per square mile (g/mi²).

[2] **Dry Mass** – The mass of residue present after drying in an oven at for zooplankton and periphyton, until the mass remains unchanged. This mass represents the total organic matter, ash and sediment, in the sample. Dry-mass values are expressed in the same units as ash mass.

[3] **Organic Mass or Volatile Mass** – Refers to the mass of a living substance as the difference between the dry mass and ash mass and represents the actual mass of the living matter. The organic mass is expressed in the same units as for the ash mass and dry mass.

[4] **Wet Mass** – The mass of living matter plus contained water.

Biota

All living organisms of a region.

Blinds

Water samples containing a chemical of known concentration given a fictitious company name and slipped into the sample flow of the lab to test the impartiality of the lab staff.

Bloom

A readily visible concentrated growth or aggregation of plankton (plant and animal).

Blue-Green Algae

A group of algae with a blue pigment, in addition to the green chlorophyll. A stench is often associated with the decomposition of dense blooms of blue-green algae in fertile lakes.

Buffer

A solution which is resistant to pH changes, or a solution or liquid whose chemical makeup tends to neutralize acids or bases without a great change in pH. Surface waters and soils with chemical buffers are not as susceptible to acid deposition as those with poor-buffering capacity.

C**Carbon-Adsorption**

A physical-chemical waste treatment process in which the effluent is passed through activated charcoal which will remove over 98 percent of the organic matter that resists normal biological treatment.

Cation

The positively-charged particle or ion in an electrolyzed solution which travels to the cathode and is there discharged, evolved, or deposited. Also, by extension, any positive ion.

Cation Exchange

A chemical process in which Cations of like charge are exchanged equally between a solid, such as zeolite, and a solution, such as water. The process is often used to soften water.

Chemical Oxygen Demand (COD)

The measure of the oxygen required to reduce all oxidizable material in wastes. It is evaluated chemically through use of sulphuric acid and potassium dichromate to determine the quantity of oxygen required for total oxidation.

The COD of animal wastes are generally several times as great as their five-day BOD. COD probably more nearly indicates long-term oxygen requirements of these wastes. The pollutorial effect of COD is the same as that for BOD. Wastes with high COD tend to add to the bottom deposits of sludges which in streams and lakes constitute a continuous benthic demand on dissolved oxygen in the water above.

Chlorination

The application of chlorine to water for purposes of disinfection (ineffective against many viruses).

Chronic

Showing effects only over a long period of time, as in chronic toxicity. Generally greater than 24 hours of exposure.

Clean Water Standards (EPA)

Generally refers to any enforceable limitation, control, condition, prohibition, standard, or other requirement which is promulgated pursuant to the Federal Water Pollution Control Act (Clean Water Act) [Public Law 92–500] or contained in a permit issued to a discharger by the U.S. Environmental Protection Agency (EPA) or by a State under an approved program, as authorized by Section 402 of the Clean Water Act, or by local governments to ensure compliance with pre-treatment regulations as required by Section 307 of the Clean Water Act.

Coagulation-Sedimentation (also known as Clarification)

A physical-chemical waste treatment process which removes essentially all suspended solids and reduces concentrations of phosphates by over 90 percent. Chemicals called flocculants are used to bunch the particles together into larger masses which can then be removed. Clarifying chemicals can be simply and economically added to a conventional biological system at any of several points in the existing treatment process.

Coliform (Bacteria)

(1) A group of bacteria predominantly inhabiting the intestines of humans or animals but also found in soil. While typically harmless themselves, coliform bacteria are commonly used as indicators of the possible presence of pathogenic organisms.

(2) A group of organisms (Colon bacilli) usually found in the colons of animals and humans; non-pathogenic micro-organisms used in testing water to indicate the presence of pathogenic bacteria. The presence of coliform bacteria in water is an indicator of possible pollution by fecal material. Generally reported as colonies per 100 milliliters (ml) of sample.

Coliform Group Organisms (Total Coliform Organisms)

All of the aerobic and facultative anaerobic gram-negative, non-spore-forming rod-shaped bacteria that ferment lactose broth with gas formation within 48 hours at 35 degrees C. Usually reported as the number of coliform organisms per 100 ml of water or sample.

Colloidal Substances

Minute clay or other substances which do not settle out of suspension without use of a flocculant.

Color

The color of water is attributed to substances in solution after the suspended materials have been removed. These substances may be organic or mineral in origin.

Determination of the color of water is made using the standard platinum-cobalt method after centrifugation of the sample. The unit of color considered as standard is the color produced by 1 mg/l of platinum in water. Results are expressed as units of color. Color in excess of 50 units may limit photosynthesis and have a deleterious effect upon aquatic life, particularly phytoplanktons and benthos.

Composite Sample

(Water Quality) A representative water or wastewater sample made up of individual smaller samples taken at periodic intervals.

Concentration

(1) The density or amount of a substance in a solution.

(2) The amount of Solute present in proportion to the total Solution. More specifically, a measure of the average density of pollutants or other constituents, usually specified in terms of mass per unit volume of water or other Solvent (e.g., milligrams per liter) or in terms of relative volume of solute per unit volume of water (e.g., parts per million).

Confined or Concentrated Animal Feeding Operation (CAFO) or Facility

Feeding cattle, swine, sheep, fowl, or other animals for marketing purposes within any confined area or enclosure which is not normally used for raising crops or as pasture. Specific application is based on the number and kind of animals confined and the potential to discharge to State waters.

Constituents

Any of the chemical substances found in water. Typically, measurements of such constituents in sampled drinking water may consist of Total Dissolved Solids (TDS), Hardness

(concentrations of Calcium and Magnesium, specifically), Sodium, Potassium, Sulfate, Chloride, Nitrate, Alkalinity, Bicarbonate, Carbonate, Fluoride, Arsenic, Iron, Manganese, Copper, Zinc, Barium, Boron, Silica, as well as other physical characteristics and properties such as water color, turbidity, pH, and Electro-Conductivity (EC).

Contaminant

(1) In a broad sense any physical, chemical, biological, or radiological substance or matter in the environment.

(2) (Water Quality) In more restricted usage, a substance in water of public health or welfare concern. Also, an undesirable substance not normally present, or a usually high concentration of a naturally occurring substance, in water, soil, or other environmental medium.

Contamination (Water)

Impairment of the quality of water sources by sewage, industrial waste, or other matter to a degree which creates actual hazard to public health. (Compare with Pollution definition.)

Council on Environmental Quality (CEQ)

An advisory council in the Executive Office of the President of the United States established by PL 91-190. The Chairman of CEQ is the Director of the Office of Environmental Quality, also in the Executive Office, which was established by PL 91-224, April 3, 1970.

The Council on Environmental Quality is composed of three members appointed by the President. The duties and functions of CEQ are:

[1] To assist and advise the President in the preparation of the Environmental Quality Report required under Section 201, PL 91-190, and;

[2] To assist and advise the President on policies and programs of the Federal government affecting environmental quality.

Cumulative Impact

The environmental impacts of a proposed action in combination with the impacts of other past, existing and proposed actions. Each increment from each action may not be noticeable but cumulative impacts may be noticeable when all increments are considered together.

D

Denitrification

The conversion of nitrates by anaerobic micro-organisms to nitrogen gas. Primary requirements for denitrification include nitrogen to nitrate form, reducing conditions and a supply of energy for the micro-organisms involved.

Detachment

The removal of transportable fragments of soil material from a soil mass by an eroding agent, usually falling raindrops, running water, or wind. Through this process, soil particles or aggregates are made ready for transport, the first stage in soil erosion.

Dilute

To make thinner or less concentrated by adding a liquid such as water.

Disposal Lagoon

A pond of water plus wastes flushed from animal production operations. Lagoons are designed to decompose or digest waste material through bacterial action. Disposal lagoons may be designed for either aerobic or anaerobic decomposition of organic matter wastes. Montana's short warm season limits the usefulness of lagoon treatment for animal wastes.

Discharge (Hydrologic)

(1) The volume of water passing through a channel during a given time, usually measured in cubic feet per second (cfs).

(2) In its simplest concept, discharge means outflow and is used as a measure of the rate at which a volume of water passes a given point. Therefore, the use of this term is not restricted as to course or location, and it can be used to describe the flow of water from a pipe or a drainage basin. With reference to groundwater, the process by which groundwater leaves the Zone of Saturation via Evaporation, Evapotranspiration, or by flow to the surface through springs and seeps. The data in the reports of the U.S. Geological Survey (USGS) on surface water represent the total fluids measured. Thus, the terms discharge, streamflow, and runoff represent water with the solids dissolved in it and the sediment mixed with it. Of these terms, discharge is the most comprehensive. The discharge of drainage basins is distinguished as follows:

[1] **Yield** — The total water runout or “water crop” and includes runoff plus underflow;

[2] **Runoff** — That part of water yield that appears in streams; and

[3] **Streamflow** — The actual flow in streams, whether or not subject to regulation or underflow.

Each of these terms can be reported in total volumes (e.g., acre-feet) or time-related rates of flow (e.g., cubic feet per second or acre-feet per year).

Discharge of a Pollutant

Any addition of any pollutant to State waters from any point source; any addition of any pollutant to the waters of the contiguous zone or the ocean from any point source other than a vessel (PL 92-500).

Dissolved Oxygen

The oxygen freely available in water and necessary for aquatic life and the oxidation of organic matter. Usually measured as mg per liter (mg/l) or less preferred parts per million (ppm).

Drinking Water

A term used synonymously with Potable Water, and refers to water that meets federal drinking water standards of the Safe Drinking Water Act [SDWA] (Public Law 93–523) as well as State and Local water quality standards and is considered safe for human consumption. Fresh water that exceeds established standards for chloride content and dissolved solids limits is often referred to as slightly saline, brackish, or non-potable water and is either diluted with fresher water or treated through a desalination process to meet drinking water standards for public supply.

Drinking Water Standards

Drinking water standards established by State agencies, the U.S. Public Health Service, and the U.S. Environmental Protection Agency (EPA) for drinking water throughout the United States. [See Appendix B–1 for regulated contaminants and Appendix B–2 for proposed contaminants to be regulated by the Safe Drinking Water Act [SDWA] (Public Law 93–523)].

Duplicates

(Water Quality) Two separate samples with separate containers taken at the same time at the same location.

E

E. Coli (Escherichia Coli)

A bacterial species which inhabits the intestinal tract of human and other warm-blooded animals. Although it may pose no threat to human health, its presence in drinking water does indicate the presence of other, more dangerous bacteria.

Effluent

Any point source wastewater discharged directly or indirectly to the waters of the state or to any storm sewer, and the runoff from land used for disposition of wastewater and sludges.

Effluent Limitation

An amount of concentration of a water pollutant that can be legally discharged into a water body by a *Point Source (PS)*, expressed as the maximum daily discharge, the maximum discharge per amount of product, and/or the concentration limit in the wastewater stream, as a 24-hour or 30-day average. The applicable technology-based standard is set by the *U.S. Environmental Protection Agency (EPA)* by *Standard Industrial Classification (SIC) Code*, but differs between new and existing sources and by broad types of water pollutants: conventional pollutants, toxic pollutants, non-conventional, non-toxic pollutants; dredge and fill wastes; and heat discharges.

Effluent Standard

The maximum amounts of specific pollutants allowable in wastewater discharged by an industrial facility or wastewater treatment plant. The standards are set for individual pollutants and apply across all industrial categories. This term can be contrasted with Effluent Limitations, which are set for individual pollutants by a Standard Industrial Classification (SIC) Code.

Electrical Conductivity

The reciprocal of the electrical resistivity. The resistivity is the resistance in ohms of a conductor, metallic or electrolytic, which is 1 cm long and has a cross-sectional area of 1 square cm. Hence, electrical conductivity is expressed in reciprocal ohms per centimeter, or mhos per centimeter. The terms "electrical conductivity" and "specific electrical conductivity" have identical meaning.

Electrical Conductivity (EC) is used to express the total concentration of soluble salts in water.

Electrodialysis

A physical-chemical method used if a reduction in dissolved salts is required. Soluble salts are separated from water by using an electrical current and an arrangement of permeable membranes. The process is rarely used unless the water is to be reused for municipal or industrial supplies. It is capable of reducing salt loads by over 50 percent. (The process is not currently considered to be cost-effective.)

Emergent Aquatic Plants

Plants that are rooted at the bottom but project above the water surface. Examples are cattails and bulrushes.

Environment

The sum of all external influences and conditions affecting the life and the development of an organism.

Environmental Protection Agency (EPA)

An independent regulator agency reporting to the President established December 2, 1970. EPA is independent of substantive Cabinet Departments. As a regulatory agency, EPA has quasi-judicial functions. This means that in areas defined by Congress and the President that EPA is a law enforcement agency, and to a degree functions as police, as prosecutors, and as judges. EPA sets standards, evaluates public adherence to standards, and enforces the laws requiring compliance with standards.

In addition to establishing and enforcing standards and monitoring pollution in the environment, EPA conducts research and demonstrations, and assists state and local governments in their pollution control efforts.

Ephemeral (Stream)

A stream that flows only in direct response to precipitation, and thus discontinues its flow during dry seasons. Such flow is usually of short duration. Most of the dry washes of more arid regions may be classified as ephemeral streams.

Equivalent; Equivalent Weight

The weight in grams of an ion or compound that combines with or replaces 1 gm of hydrogen. The atomic weight or formula weight divided by its valence.

Equivalent per Million

An equivalent weight of an ion or salt per one million gm of solution or soil. For solution, equivalents per million (e.p.m.) and milliequivalent per liter (meq/l) are numerically identical if the specific gravity of the solution is 1.0.

Euphotic Zone

The lighted region that extends vertically from the water surface to the level at which photosynthesis fails to occur because of ineffective light penetration.

Eutrophic (Water)

Pertaining to a lake or other body of water characterized by large nutrient concentrations such as nitrogen and phosphorus and resulting high productivity. Such waters are often shallow, with algal blooms and periods of oxygen deficiency. Slightly or moderately eutrophic water can be healthful and support a complex web of plant and animal life. However, such waters are generally undesirable for drinking water and other needs. Degrees of *Eutrophication* typically range from *Oligotrophic* water (maximum transparency, minimum chlorophyll-a, minimum phosphorus) through *Mesotrophic*, *Eutrophic*, to *Hypereutrophic* water (minimum transparency, maximum chlorophyll-a, maximum phosphorus).

Eutrophication

(1) The degradation of water quality due to enrichment by nutrients, primarily Nitrogen (N) and Phosphorus (P), which results in excessive plant (principally algae) growth and decay. When levels of N:P are about 7:1, algae will thrive. Low Dissolved Oxygen (DO) in the water is a common consequence.

(2) The process of enrichment of water bodies by nutrients.

(3) Over-enrichment of a lake or other water body with nutrients, resulting in excessive growth of organisms and the depletion of oxygen. Degrees of *Eutrophication* typically range from *Oligotrophic* water (maximum transparency, minimum chlorophyll-a, minimum phosphorus) through *Mesotrophic*, *Eutrophic*, to *Hypereutrophic* water (minimum transparency, maximum chlorophyll-a, maximum phosphorus). Eutrophication of a lake normally contributes to its slow evolution into a *Bog* or *Marsh* and ultimately to dry land. Eutrophication may be accelerated by human activities and thereby speed up the aging process.

Exceedence

(Water Quality) The violation of the pollutant levels permitted by environmental protection standards.

F

Faculative Aerobe

An organism that although fundamentally an anaerobe can grow in the presence of free oxygen.

Faculative Anaerobe

An organism that although fundamentally an aerobe can grow in the absence of free oxygen.

Fecal Coliform Bacteria

The portion of the coliform group which is present in the gut or feces of warm-blooded animals. It generally includes organisms which are capable of producing gas from lactose broth in a suitable culture medium within 24 hours at $44.5^{\circ} \pm 0.5^{\circ}$ C. Used as an indicator of contamination or pollution.

Fecal Streptococcal Bacteria

Bacteria found also in the intestine of warm-blooded animals. Their presence in water is considered to verify fecal pollution. They are characterized as gram-positive, cocci bacteria which are capable of growth in brain-heart infusion broth. In the laboratory they are defined as all the organisms that produce colonies which produce red or pink colonies within 24 hours on KF-streptococcus medium (nutrient medium for bacterial growth). Their concentrations are expressed as numbers of colonies per 100 ml of sample.

Filter Strip

A strip or area of vegetation used for removing sediment, organic matter, and other pollutants from runoff and wastewater.

Food-to-Organism Ratio (F:M)

An important parameter in the biological treatment of animal wasters. F:M is approximated by the pounds of BOD applied per day per pound of Volatile Suspended Solids (VSS) in the treatment plant. (lb. BOD/day/lb. VSS).

Flocculation

The process of separating suspended solids by chemical creation of clumps or flocs.

Freshwater (Fresh Water)

- (1) Of, relating to, living in, or consisting of water that is not salty.
- (2) Water with salinity less than 0.5‰ (parts per thousand) dissolved salts.
- (3) Water that contains less than 1,000 milligrams per liter (mg/l) of dissolved solids; generally, more than 500 mg/l of dissolved solids is undesirable for drinking and many industrial uses.
- (4) (Nautical) Accustomed to sailing on inland waters only as a fresh water sailor.

G**Giardia Lamblia**

A flagellate protozoan that causes the severe gastro-intestinal illness Giardiasis, when it contaminates drinking water.

Giardiasis

A disease that results from an infection by the protozoan parasite Giardia Intestinalis, caused by drinking water that is either not filtered or not chlorinated. The disorder is more prevalent in children than in adults and is characterized by abdominal discomfort, nausea, and alternating constipation and diarrhea.

Grab Sample

Typically, a single water or air sample drawn over a short time period. As a result, the sample is not representative of long-term conditions at the sampling site. This type of sampling yields data that provides a snapshot of conditions or concentrations at a particular point in time.

H

Heavy Metals

(1) Those metals that have high density; in agronomic usage these include copper, iron, manganese, molybdenum, cobalt, zinc, cadmium, mercury, nickel and lead. These substances are considered toxic at specified concentrations.

(2) Metals having a specific gravity of 5.0 or greater; generally toxic in relatively low concentrations to plant and animal life and tend to accumulate in the food chain. Examples include lead, mercury, cadmium, chromium, and arsenic.

Heterotrophic Organism

Organisms that are dependent on organic matter for food.

Holding Pond

An impoundment used to temporarily store solid and liquid wastes and polluted runoff from concentrated livestock or waste areas until they can be safely utilized, evaporated or otherwise disposed of. Sometimes called a retention pond.

Holding Time

(Water Quality) The time allowed between removal of samples from water sources for bacteriological analysis and the processing of those samples.

Hyporheic Zone

Zone of substrate in a stream bottom extending 1 to 2 meters (3.3 to 6.6 feet) below the surface of the stream bed. In gaining and in losing streams, water and dissolved chemicals can move repeatedly over short distances between the stream and the shallow subsurface below the streambed. The hyporheic zone is comprised of the resulting subsurface environments, which contain variable proportions of water from groundwater and surface water. These zones can be active sites for aquatic life, for example, the spawning success of fish may be greater where flow from the stream brings oxygen into contact with eggs that were deposited within the course bottom sediment or where stream temperatures are modulated by groundwater flows.

Hypoxia

A condition in which natural waters have a low concentration of dissolved oxygen (about 2 milligrams per liter as compared with a normal level of 8 to 10 milligrams per liter). Most game and commercial species of fish avoid waters that are Hypoxic.

I

Impaired

Water bodies that cannot reasonably be expected to attain or maintain applicable water quality standards, and at least one beneficial use shows some degree of degradation.

Industrial Wastes

Any solid, liquid, or gaseous wastes resulting from any process, or from excess energy of industry, manufacturing, trade, or business or from the development, processing, or recovery, except for agricultural crop raising of any natural resources.

Instantaneous Discharge

The discharge at a particular instant of time.

Intermittent Stream

A stream that carries water only part of the time, generally in response to periods of heavy runoff either from snowmelt or storms; a stream or part of a stream that flows only in direct response to precipitation. It receives little or no water from springs or other sources. It is dry for a large part of the year, generally more than three months. Flow generally occurs for several weeks or months in response to seasonal precipitation, due to groundwater discharge, in contrast to the Ephemeral Stream that flows but a few hours or days following a single storm. Also referred to as Seasonal Streams.

Interstate Waters

All waters which cross or form a part of the border between states.

Intrastate Waters

All waters of the state which are not interstate waters.

J

Jackson Turbidity Unit (JTU)

The JTU is a measurement of the turbidity, or lack of transparency, of water. It is measured by lighting a candle under a cylindrical transparent glass tube and pouring a sample of water into the tube until an observer looking from the top of the tube cannot see the image of the candle flame. The number of JTU's varies inversely and non-linearly with the height of the sample (e.g., a sample which measures 2.3 cm has a turbidity of 1,000 JTU's whereas a sample measuring 72.9 cm has a turbidity of 25 JTU's).

L

Laboratory Blank

An artificial sample, usually distilled water, introduced to a chemical analyzer to observe the response of the instrument to a sample that does not contain the material being measured. The blank can also detect any contamination occurring during laboratory processing of the sample.

Land Application

An advanced physical, chemical and biological waste treatment process that uses soil, air, plants and bacteria to remove pollutants from wastewater. In this process, sewage is pre-treated to screen and settle out large solids and then held in shallow lagoons to accelerate the action of bacteria. The sludge settles out and is applied to the land as fertilizer while the liquid (containing suspended and dissolved nutrients) is chlorinated (sewage) and sprayed on the land. Final purification is accomplished by natural biological, chemical and physical reactions in the soil.

Leachate

Liquid which has percolated through the ground, such as water seeping through a sanitary landfill, wastes, pesticides, or fertilizers. Leaching may occur in farming areas, feedlots, and landfills, and may result in hazardous substances entering surface water, ground water, or soil.

Leaching Requirements (LR)

The fraction of the water entering the soil that must pass through the root zone in order to prevent soil salinity from exceeding a specified value. Leaching requirement is used primarily under steady-state or long-term average conditions.

Load

The amount of material that a transporting agency, such as a stream, a glacier, or the wind, is actually carrying at a given time. Also, the amount of power delivered to a given point. In this respect:

[1] **Base Load** = The minimum load in a stated period of time.

[2] **Firm Load** = That part of the system load which must be met on demand.

[3] **Peak Load** = Literally, the maximum load in a stated period of time. Sometimes the term peak load is used in a general sense to describe that portion of the load above the base load.

Load Allocation (LA)

(Water Quality) The portion of the pollution Load of a stream attributable to human Non-Point Sources (NPS) of pollution. The amount of pollution from each point source is the Waste Load Allocation.

Lotic Waters

Describing the waters of rivers and streams (flowing waters) as compared to Lentic Waters of ponds or marshes (standing waters).

M

Macro-invertebrate

An animal without a backbone, large enough to see without magnification.

Macro-organisms

Plants, animals or fungal organisms visible to the unaided eye.

Maximum Contaminant Level (MCL)

(1) Legally enforceable standards regulating the maximum allowed amount of certain chemicals in drinking water. MCLs must be met by the time water reaches an individual's property.

(2) The designation given by the U.S. Environmental Protection Agency (EPA) to water quality standards promulgated under the Safe Drinking Water Act (SDWA) (Public Law 93–523). As prescribed by the EPA after research of a contaminant, the MCL is the greatest amount of a contaminant that can be present in drinking water without causing a risk to human health. MCLs are set for certain inorganic and organic chemicals, turbidity, coliform bacteria, and certain radioactive materials.

Maximum Holding Time

The longest time period that water samples can be retained between the taking of the sample and the laboratory analysis for a specific material before the results are considered invalid. The times vary from none in the case of the test for residual chlorine levels to six months for the testing of radioactivity. Some types of analyses require that preservatives be added to the sample, and some require storage of samples at refrigerated temperatures.

Mean

(Statistics) The sum of a set of observations divided by the number of observations. Also referred to as Arithmetic Mean and Sample Mean. Compare to Mode and Median.

Median

(Statistics) In a set of observations, the middle-most value with an equal number of observations lying above and below the median value.

Median Lethal Dose (LD50)

The dose lethal to 50 percent of a group of test organisms for a specified period. The dose material may be ingested or injected.

Median Tolerance Limit (TLm)

The concentration of the tested material in a suitable diluent (experimental water) at which just 50 percent of the test animals are able to survive for a specified period of exposure.

Membrane Filter

A technique of bacteriological analysis. This technique involves the running of a certain volume of water through a cellulose ester wafer which is then impregnated with growth media for bacteria.

Membrane Filtration

The use of a membrane, or more properly, a semi-permeable membrane, to separate substances when a driving force is applied across the membrane. Once considered a viable technology only for desalination, membrane processes are increasingly employed for the removal of bacteria and other microorganisms, particulate material, and natural organic material which can impart color, tastes, and odors to water and react with disinfectants to form Disinfection Byproducts (DBP). Due to their greater effectiveness, waste stream disposal, at up to 15-25 percent (and higher for the RO process) of the total treated water volume, is a significant problem with membrane treatment systems. Pressure-driven membrane filtration processes include:

[1] **Micro-Filtration (MF)** – Loosely defined as a membrane separation process using membranes with a pore size of approximately 0.03 to 10 microns, a molecular weights cutoff (MWCO) of greater than 100,000 daltons, and a relatively low feed water operating pressure of approximately 100 to 400 kPa (15-60 psi). Representative materials removed by MF include sand, silt, clays, Giardia lamblia and Cryptosporidium cysts, algae, and some bacterial species. MF is not an absolute barrier to viruses; however, when used in combination with disinfection, MF appears to control these micro-organisms in water.

[2] **Ultra-Filtration (UF)** – Involves the pressure-driven separation of materials from water using a membrane pore size of approximately 10,000 to 100,000 daltons, and an operating pressure of approximately 200 to 700 kPa (30-100 psi). UF will remove all microbiological species removed by MF (partial removal of bacteria), as well as some viruses (but not an absolute barrier to viruses) and humic materials.

[3] **Nano-Filtration (NF)** – Membranes which have a nominal pore size of approximately 0.001 microns and an MWCO of 1,000 to 100,000 daltons. Pushing water through these smaller membrane pores requires a higher operating pressure than either MF or UF. Operating pressures are usually near 600 kPa (90 psi) and can be as high as 1,000 kPa (150 psi). These systems can remove virtually all cysts, bacteria, viruses, and humic materials. They provide excellent protection from DBP formation if the disinfectant residual is added after the membrane filtration step. Because NF membranes also remove alkalinity, the product water can be corrosive and further treatment may be required. NF also removes hardness from water, which accounts for NF membranes sometimes being called “softening membranes.”

[4] **Reverse Osmosis (RO)** – This process removes contaminants from water using a semi-permeable membrane that permits only water, and not dissolved ions (such as sodium and chloride), to pass through its pores. Contaminated water is subject to a high pressure that forces pure water through the membrane, leaving contaminants behind in a brine solution. RO can effectively remove nearly all inorganic contaminants from water. RO can also effectively remove radium, natural organic substances, pesticides, cysts, bacteria, and viruses. RO is particularly effective when used in series; water passing through multiple units can achieve near zero effluent contaminant concentrations.

Method Blank

Laboratory grade water taken through the entire analytical procedure to determine if samples are being accidentally contaminated by chemicals in the lab.

Micrograms per Gram ($\mu\text{g/g}$)

A unit expressing the concentration of a chemical constituent as the mass (micrograms) of the element per unit mass (gram) of material analyzed.

Micrograms per Kilogram ($\mu\text{g/kg}$)

A unit expressing the concentration of a chemical constituent as the mass (micrograms) of the element per unit mass (kilogram) of material analyzed. One microgram per kilogram is equivalent to 1 part per billion.

Micrograms per Liter ($\mu\text{g/l}$)

A unit expressing the concentration of a chemical constituent in water as the mass (micrograms) of the element per unit volume (liter) of material analyzed. One thousand micrograms per liter is equivalent to one Milligram per Liter (mg/l). This measure is also equivalent to Parts Per Billion (PPB).

Micro-siemens per Centimeter ($\mu\text{S/cm}$)

A unit expressing the amount of electrical conductivity of a solution as measured between opposite faces of a centimeter cube of solution at a specified temperature. Siemens is the International System of Units nomenclature. It is synonymous with mhos and is the reciprocal of resistance measured in ohms.

Micro-organisms

Any minute organism invisible or barely visible to the un-aided eye.

Milliequivalents per Liter (MEQ/L)

An expression of the concentration of a material dissolved in water, calculated by dividing the concentration, in milligrams per liter, by the Equivalent Weight of the dissolved material. For example, the equivalent weight of aluminum is 9.0. A water concentration of aluminum of 1.8 milligrams per liter equals an aluminum concentration of 0.2 milliequivalent per liter.

Milligram (MG)

One-thousandth of a gram.

Milligrams per Liter (mg/l)

A unit of the concentration of a constituent water or wastewater and expresses the concentration of chemical constituents in water as the mass (milligrams) of constituents per unit volume (liter) of water. Concentration of suspended sediment also is expressed in mg/l and is based on the mass of dry sediment per liter of water-sediment mixture. It represents 0.001 gram of a constituent in 1.000 milliliter (ml) of water. It is approximately equal to one Part Per Million (PPM). The term has replaced parts per million in water quality management.

Mode

(Statistics) In a set of observations, the most frequently occurring value.

Monitoring

- (1) Sampling and analysis of air, water, soil, wildlife, and other conditions, to determine the concentrations of contaminants.
- (2) (Ecology) The component of Adaptive Management in which information is collected to track system behavior and its response to management.

N

National Environmental Policy Act (NEPA)

A 1970 Act of Congress that requires all federal agencies to incorporate environmental considerations into their decision-making processes. The act requires an Environmental Impact Statement (EIS) for any “major federal action significantly affecting the quality of the human environment.”

Natural Conditions

Conditions under which hydrologic processes and variables are not affected by human activity. For water budgets, such conditions commonly are assumed to represent long-term, steady state conditions in Montana. In Montana, natural conditions are defined as condition or material prevent from runoff or percolation over which man has no control or from developed land where all reasonable land, soil, and water conservation practices have been applied. Conditions resulting from the reasonable operation of dams at July 1, 1971, are nature. (MCA 75-5-306).

Navigable Waters

(1) Generally, those waters capable of supporting commerce.
(2) The waters of the United States, including the territorial seas, and intrastate waters, which is any body of water with any connection to the interstate waters or commerce and this includes virtually all surface water and wetlands. Despite its name, there is no requirement for vessels to be able to navigate these waters. Provisions of the *Clean Water Act (CWA)* apply to all such waters, including wetlands.

Nephelometric Turbidity Unit (NTU)

(1) A unit of measure for the turbidity of water resulting from the use of a Nephelometer and based on the amount of light that is reflected off the water.
(2) The measurement for reporting turbidity that is based on the use of a standard suspension of Formazin. Turbidity measured in NTU uses nephelometric methods that depend on passing specific light of a specific wavelength through the sample. This unit is not identical to the Jackson Turbidity Unit (JTU).

New Source

Any Point Source which is constructed after the issuance of National Standards of Performance regulations (May 1974).

Nitrification

The bacterial process of converting ammonia which is produced by aerobic decomposition of organic matter into nitrates. In nitrification, the ammonia is first oxidized by nitrite-forming bacteria to nitrites, and the nitrites are nearly immediately oxidized to nitrates by nitrate-forming bacteria.

Nitrogen Fixation

Transformation of nitrogen gas (N₂) by bacteria, blue-green algae, and other micro-organisms to nitrates. This biological transformation may be symbiotic or non-symbiotic. Electrical discharges in the atmosphere may also fix nitrogen.

Non-Degradation Policy

An environmental policy that disallows any lowering of naturally occurring quality regardless of pre-established health standards.

Non-Filtrable Residue

The total quantity of substances in a sample which can be removed by filtration through a 0.45 µm membrane filter. Reported in milligrams per liter (mg/l), and sometimes referred to as Suspended Solids.

Non-Point Source

Any non-confined area from which pollutants are discharged into a body of water, i.e., agricultural runoff, and sedimentation from construction sites.

Non-Point Source (NPS) Pollution

(1) Pollution discharged over a wide land area, not from one specific location.

(2) Water pollution caused by diffuse sources with no discernible distinct point of source, often referred to as runoff or polluted runoff from agriculture, urban areas, mining, construction sites and other sites. These are forms of diffuse pollution caused by sediment, nutrients, organic and toxic substances originating from land use activities, which are carried to lakes and streams by surface runoff. Technically, non-point source pollution, also referred to as Non-Point Water Pollution, means any water contamination that does not originate from a “point source,” which is designated in the Clean Water Act (CWA) as pollution that can be clearly identified as a discharge from a pipe, ditch, or other well-defined source. Non-point source pollution, by contrast, is contamination that occurs when rainwater, snowmelt, or irrigation washes off plowed fields, city streets, or suburban backyards. As this runoff moves across the land surface, it picks up soil particles and pollutants such as nutrients and pesticides. Some of the polluted runoff infiltrates into the soil to contaminate (and recharge) the groundwater below. The rest of the runoff deposits the soil and pollutants in rivers, lakes, wetlands, and coastal waters. Originating from numerous small sources, non-point source pollution is widespread, dispersed, and hard to pinpoint. Compared with point source pollution, it is diffuse and difficult to control or prevent. It has been estimated that non-point source pollution accounts for more than one-half of the water pollution in the United States today.

Nutrient

A chemical substance (e.g., nitrogen or phosphorous) absorbed by green plants and used for growth.

O

Oligotrophic (Water)

Pertaining to a lake or other body of water characterized by extremely low nutrient concentrations such as nitrogen and phosphorus and resulting very moderate productivity. Oligotrophic lakes are those low in nutrient materials and consequently poor areas for the development of extensive aquatic floras and faunas. Such lakes are often deep, with sandy bottoms and very limited plant growth, but the high dissolved oxygen levels. This represents the early stages in the life cycle of a lake. Degrees of *Eutrophication* typically range from *Oligotrophic* water (maximum transparency, minimum chlorophyll-a, minimum phosphorus) through *Mesotrophic*, *Eutrophic*, to *Hypereutrophic* water (minimum transparency, maximum chlorophyll-a, maximum phosphorus).

Organic

Of or related to a substance that contains carbon atoms linked together by carbon-carbon bonds. All living matter is organic.

Organic Load

(Water Quality) The amount of organic material added to a body of water. The amount of material, usually added by human activities, that must be mineralized or degraded within a particular environment.

Organic Nitrogen

Nitrogen that is bound to carbon-containing compounds. This form of nitrogen must be subjected to mineralization or decomposition before it can be used by the plant communities in aquatic and terrestrial environments. This is in contrast with inorganic nitrogen, which is in the mineral state and more readily utilized by plant communities.

Overtturn

(1) The sinking of surface water and rise of bottom water in a lake or sea that results from changes in temperature that commonly occur in spring and fall.

(2) One complete cycle of top to bottom mixing of previously stratified water masses. This phenomenon may occur in the spring or fall, or after storms, and results in uniformity of chemical and physical properties of water at all depths. Also referred to as *Turnover*, e.g., *Fall Turnover* and *Spring Turnover*.

Oxidation (Oxidizing)

(1) A chemical reaction that involves combination with oxygen or the loss of electrons.

(2) The process of increasing the positive valence or of decreasing the negative valence of an element or ion.

(3) The process by which electrons are removed from atoms or ions, also, reduction.

(4) (Water Quality) The addition of oxygen that breaks down organic waste or chemicals such as cyanides, phenols, and organic sulfur compounds in sewage by bacterial and chemical means.

Oxidation Ditch

A modified form of the activated-sludge process which may be classed as an extended aeration type of treatment. Aerobic bacteria use the organic matter in the waste as food for their metabolic processes, thus reducing the biologically degradable organics to stable material with carbon dioxide and water as by-products. The oxidation ditch is made up of two principal parts: a continuous open-channel ditch, usually shaped like a race track, and an aeration rotor that supplies the oxygen and circulates the ditch contents.

Oxidation Pond (Naturally Aerated Lagoon)

A shallow basin 3 to 5 feet deep for the purpose of treating sewage or other wastewater by storage under climatic conditions (warmth, light, and wind) that promote the introduction of atmospheric oxygen and that favor the growth of algae. Bacterial decomposition of the wastes releases carbon dioxide which promotes heavy growth of algae. Ammonia and other plant-growth substances are used up by the algae and dissolved oxygen is kept at a high level. The driving force in this process is photosynthesis, supported by a symbiosis between saprophytic bacteria and the algae.

Oxygen Demand

The need for molecular oxygen (O₂) to meet the needs of biological and chemical processes in water. The amount of molecular oxygen that will dissolve in water is extremely limited; however, the involvement of oxygen in biological and chemical processes is extensive. Consequently, the amount of oxygen dissolved in water becomes a critical environment constraint on the biota living in the water. The metabolism of large organisms like submerged plants and fish, the micro-organisms engaged in decomposition, and spontaneous chemical reactions all require (demand) a portion of a limited resource, molecular oxygen.

P

Particulate Matter

(Water Quality) In water pollution, particulate matter describes solid material in either the solid or dissolved states. Insoluble particulate matter includes particulate substances that either settle from water that is allowed to stand or are removed by passing the water through a filter.

Sand, clay, and some organic matter constitute insoluble particulate matter. Dissolved substances that will neither settle if water is allowed to stand nor be removed by passage through a filter, but which will be recovered if the water is allowed to evaporate, are called dissolved particulate matter. Salt is an example example of this type of particulate matter. In air pollution, particulate matter is used to describe either solid particles or liquid droplets that are carried by a stream or air or other gasses.

Parts Per Billion (PPB)

The number of "parts" by weight of a substance per billion parts of water. Used to measure extremely small concentrate.

Parts Per Million (PPM)

The number of "parts" by weight of a substance per million parts of water. This unit is commonly used to represent pollutant concentrations. Large concentrations are expressed in percentages.

Parts Per Thousands (PPT)

An expression of concentration which indicates one unit is contained in a total of a thousands units. It is normally used to specify the salinity of water and commonly indicated by the symbol "‰".

Pathogen

A disease-producing agent; usually applied to a living organism (i.e., biological). Generally, any viruses, bacteria, or fungi that cause disease.

Peak Flow

The maximum instantaneous discharge of a stream or river at a given location. It usually occurs at or near the time of maximum stage.

Periphyton

An assemblage of micro-organisms (plants and animals) firmly attached to and growing upon solid surfaces, such as the bottom of a stream, rocks, logs, pilings, and other structures. While primarily consisting of algae, they also include bacteria, fungi, protozoa, rotifers, and other small organisms. Periphyton are useful indicators of water quality.

Permeability

(1) The capacity of soil, sediment, or porous rock to transmit water; the property of soil or rock that allows passage of water through it.

(2) For a rock or an earth material, the ability to transmit fluids; the rate at which liquids pass through soil or other materials in a specified direction. It is measured by the rate at which a fluid of standard viscosity can move through a material in a given interval of time under a given *Hydraulic Gradient*. Permeability for underground water is sometimes expressed numerically as the number of gallons per day that will flow through a cross section of 1 square foot, at 60EF, under a hydraulic gradient of 100 percent. Permeability is equal to velocity of flow divided by hydraulic gradient. The following permeability terms apply:

- [1] **Very Slow** - less than 0.05 inch per hour;
- [2] **Slow** - 0.05 to 0.20 inch per hour;
- [3] **Moderately Slow** - 0.20 to 0.80 inch per hour;
- [4] **Moderate** - 0.80 to 2.50 inches per hour;
- [5] **Moderately Rapid** - 2.50 to 5.0 inches per hour;
- [6] **Rapid** - 5.0 to 10.0 inches per hour; and
- [7] **Very Rapid** - More than 10.0 inches per hour.

Permit

A legally binding document issued by a State or Federal permit agency to the owner or manager of a point-source discharge. The permit document contains a schedule of compliance requiring the permit holder to achieve a specified standard or limitation (by constructing treatment facilities or modifying plant processes) by a specified date. Permit documents also specify monitoring and reporting requirements to be conducted by the applicant. All permits are valid for a maximum of five years.

Persistence

The relative ability of a chemical to remain chemically stable following its release into the environment. Persistent chemicals resist bio-degradation and thus are of greater concern in the treatment of water and wastes.

Photosynthesis

The process by which simple sugars and starches are produced from carbon dioxide and water by living cells with the aid of chlorophyll and in the presence of light. In photosynthesis oxygen is produced as a product of reaction.

Physical-Chemical Treatment

Advanced methods of waste treatment that include a number of versatile techniques that do not rely on biological processes. In an exclusively physical-chemical system, these techniques can be used in series to provide any desired level of waste treatment—including removal of phosphates, mineral salts, and suspended solids. One or more of these techniques can also be used in combination with biological treatment to remove a particular troublesome pollutant or to increase the capacity of the facility. Such combinations of biological, physical or chemical treatment methods offer an economical means of adapting to specific changes in water quality requirements and qualitative shifts in waste loads. Major physical-chemical methods in use or under experimental study include: coagulation-sedimentation, carbon adsorption, electro-dialysis, reverse osmosis, and land disposal.

Phytoplankton

Microscopic floating plants, mainly algae, that live suspended in bodies of water and that drift about because they cannot move by themselves or because they are too small or too weak to swim effectively against a current.

Phyto-Remediation (Phytoremediation)

The use of plants to cleanse polluted and contaminated soils. Under this process, certain plants (e.g., sunflowers and Indian mustard) are highly effective in removing heavy metals and other toxic wastes through their uptake of water in the soil, a process which may be enhanced by the addition of chemicals to facilitate the absorption process. The plants are then harvested and discarded in a specially designated site or sent to a smelter where the metals can be extracted and sold off. The process, of course, is limited to the depth of the plant's roots.

Plankton

- (1) Minute floating forms of microscopic plants and animals in water which cannot get about to any extent under their own power.
- (2) The community of suspended, floating, or weakly swimming organisms that live in the open water or lakes and rivers. They form the important beginnings of food chains for larger animals. Concentrations are expressed as a number of cells per milliliter (cells/mL of sample).

Point Source

- (1) A stationary or clearly identifiable source of a large individual water or air pollution emission, generally of an industrial nature.
- (2) Any discernible, confined, or discrete conveyance from which pollutants are or may be discharged, including (but not limited to) pipes, ditches, channels, tunnels, conduits, wells,

containers, rolling stock, concentrated animal feeding operations (cafo), or vessels. Point source is also legally and more precisely defined in Federal Regulations. Contrast with *Non-Point Source (NPS) Pollution*.

Point Source (PS) Pollution

(1) Pollution originating from any discrete source.

(2) Pollutants discharged from any distinct, identifiable point or source, including pipes, ditches, channels, sewers, tunnels, wells, containers of various types, concentrated animal feeding operations (cafo), or floating craft. Also referred to as *Point Source of Pollution*. Also see *Non-Point Source (NPS) Pollution*.

Point Waste Load Allocation

The amount of a particular pollutant a *Point Source*, e.g., a wastewater treatment facility, can discharge over a specified period of time into a receiving body of water. Allocations are a result of agreed-upon water quality standards for a stream.

Pollutant

Waste discharged into water including: dredged spoil, solid waste, incinerator residue, sewage, sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal and agricultural waste; but not including sewage discharged from vessels nor material injected into wells in connection with the production of oil and gas (PL 92-500).

Pollution

The man-made or man-induced alteration of the chemical, physical, biological and radiological integrity of water making it less desirable for the propagation of balance indigenous populations of fish, for recreation, industry or wildlife uses.

Pollution Indicator Organism

(Water Quality) A plant or animal species that is not normally present in an aquatic environment unless the body of water has been subjected to damage by pollution. For example, *Escherichia coli* is a bacterium that is not found in the aquatic environment unless the system has been contaminated by the addition of fecal material. The organism signals the presence of pollution.

Precipitate

A solid which forms from a liquid suspension as a result of a chemical reaction. The material (floc) is insoluble in water and will settle out over time.

Preservative

A chemical added to a water sample to keep it stable and prevent compounds in it from changing to other forms or to prevent micro-organism densities from changing prior to analysis.

Pre-Treatment

Any process used to reduce the pollutant load before the waste is introduced into a sewer system or delivered to a treatment plant.

Primary Contact

Any recreational or other water use in which there is prolonged and intimate contact with the water involving considerable risk or ingesting water in quantities sufficient to pose a significant health hazard, such as swimming and water skiing.

Primary Productivity

A measure of algal productivity or rate of growth in a body of water, the primary productivity measures the mass of carbon used annually by algae per unit area of lake surface. This measure, also referred to as the *Algal Growth Rate*, is expressed as an index figure in grams of

carbon per square meter per year, and indicates the state of *Eutrophication* of a body of water. Algal productivity is influenced by the quantities of nutrients that flow into, or fall onto, the lake each year and the number of days of sunshine. Another important factor is the mixing of the lake, which brings up to the surface where algae exist nutrients which have accumulated near the bottom of the lake.

Primary Treatment

The first stage in wastewater treatment in which floating or settleable solids are mechanically removed by screening or sedimentation. In this process the sewage is first screened to remove floating solids. Next, the sewage passes into a chamber where sand and grit settle. Suspended solids are then settled out in a sedimentation tank, collecting on the bottom as raw sludge. Finally, the wastewater is chlorinated to kill disease-causing bacteria to reduce odor. At best, primary treatment removes only about 35 percent of BOD, too little to protect water quality.

Priority Pollutants

(Water Quality) A list of 129 chemicals in 65 classes of chemical materials defined as toxic pollutants by Section 307 of the 1977 *Clean Water Act (CWA)*, which also required technology-based effluent standards for the control of these chemicals.

Public and Food Processing Water Supply

Any water use in which water is withdrawn from surface waters of the state for human consumption or for processing of food products intended for human consumption.

R

Random Sample

(Statistics) A sample selected in such a manner that all possible samples of the same size have an equal and independent chance of being included.

Receiving Waters

Bodies of water into which wastewater effluents are discharged.

Replicate Samples

A group of samples collected in a manner such that the samples are thought to be essentially identical in composition.

Reverse osmosis

(1) (Desalination) Refers to the process of removing salts from water using a membrane. With reverse osmosis, the product water passes through a fine membrane that the salts are unable to pass through, while the salt waste (brine) is removed and disposed. This process differs from electro-dialysis, where the salts are extracted from the feed water by using a membrane with an electrical current to separate the ions. The positive ions go through one membrane, while the negative ions flow through a different membrane, leaving the end product of fresh water.

(2) (Water Quality) An advanced method of water or wastewater treatment that relies on a *Semi-permeable Membrane* to separate waters from pollutants. An external force is used to reverse the normal osmotic process resulting in the solvent moving from a solution of higher concentration to one of lower concentration.

Richness

(Biological) The total number of species in an area, usually expressed as the number of species divided by the total number of individuals, or the number of species per unit area.

Riparian Areas (Habitat)

(1) Land areas directly influenced by a body of water. Usually such areas have visible vegetation or physical characteristics showing this water influence. Stream sides, lake borders, and marshes are typical riparian areas. Generally refers to such areas along flowing bodies of water. The term *Littoral* is generally used to denote such areas along non-flowing bodies of water.

(2) (USFWS) Plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent *Lotic* and *Lentic* water bodies (rivers, streams, lakes, or drainageways). Riparian areas have one or both of the following characteristics: (a) distinctively different vegetative species than adjacent areas, and (b) species similar to adjacent areas but exhibiting more vigorous or robust growth forms. Riparian areas are usually transitional between *Wetlands* and *Uplands*.

Riparian Zone

(1) Areas adjacent to a stream that are saturated by groundwater or intermittently inundated by surface water at a frequency and duration sufficient to support the prevalence of vegetation typically adapted for life in saturated soil.

(2) The transition area between the aquatic ecosystem and the nearby, upland terrestrial ecosystem. Zones are identified by soil characteristics and/or plant communities and include the wet areas in and near streams, ponds, lakes, springs and other surface waters. Also see *Riparian Areas*.

S

Salinity

(1) The concentration of dissolved salts in water or soil water. Salinity may be expressed in terms of a concentration or as an electrical conductivity. When describing salinity influenced by sea water, salinity often refers to the concentration of chlorides in the water.

(2) The relative concentration of salts, usually sodium chloride, in a given water sample. It is usually expressed in terms of the number of parts per thousand (‰) or parts per million (ppm) of Chloride (Cl). Although the measurement takes into account all of the dissolved salts, Sodium Chloride (NaCl) normally constitutes the primary salt being measured. Salinity can harm many plants, causing leaves to scorch and turn yellow and stunting plant growth. As a reference, the salinity of sea water is approximately 35‰ or 35,000 ppm. See *Salts* for comparative salt concentrations in water.

Sample Size

(Statistics) The number of individual observations. The sample size, i.e., number of observations about a particular event or phenomenon, has important implications on how representative the sample is of the *Population*.

Schedule of Compliance

Description of remedial actions to be accomplished by the permit holder (type of facility to be installed or alternative control measures to be established) and a sequence of actions leading to compliance with applicable standards.

Secchi disc

A device used to measure visibility depths in water. The upper surface of a circular metal plate, 20 centimeters in diameter, is divided into four quadrants and so painted that two quadrants directly opposite each other are black and the intervening ones are white. When suspended to various depths of water by means of a graduated line, its point of disappearance indicates the limit of visibility. The Secchi disc is commonly used to measure the clarity of waters.

Secondary Contract

Any recreational or other water use in which contact with the water is accidental and in which the probability of ingesting appreciable quantities of water is minimal, such as fishing, commercial and recreational boating and any limited contact incident to shoreline activity.

Secondary Treatment

The second step in most waste treatment systems in which bacteria is used under controlled conditions to rapidly decompose organic waste. The principal types of secondary treatment are the trickling filter and activated-sludge process. A trickling filter is a bed of stones or synthetic material through which the sewage passes after primary treatment. Bacteria on the stones consumes most of the organic matter in the sewage as it trickles through the bed. In the activated-sludge process, sewage that has undergone primary treatment is mixed with air and bacteria-laden sludge and held for several hours. Sedimentation and chlorination complete the process. While a plant combining primary and secondary treatment may be able to remove up to 80 or 90 percent BOD, secondary treatment is effective only for organic wastes. Complex industrial wastes are often not susceptible to biological treatment and damaging to the bacteria in the treatment plant.

Sediment

Is solid material, both mineral and organic, that is being transported or has been moved from its site of origin by water, ice, air, or gravity.

Sediment Discharge, Total

The rate at which dry weight of sediment passes a section of a stream or the quantity of sediment, as measured by dry weight or by volume that is discharged in a given time. Typically reported in tons per day.

Sediment Load, Total

Also referred to as the total load, a term that refers to the total sediment (bed load plus suspended-sediment load) that is in transport. The term needs to be qualified, however, such as "annual suspended-sediment load" or "sand-size suspended-sediment load," and so on. It is not synonymous with total sediment discharge.

Sedimentation

- (1) Strictly, the act or process of depositing sediment from suspension in water. Broadly, all the processes whereby particles of rock material are accumulated to form sedimentary deposits. Sedimentation, as commonly used, involves not only aqueous but also glacial, aeolian, and organic agents.
- (2) (Water Quality) Letting solids settle out of wastewater by gravity during treatment.

Separated Sewer Systems

Consist of sanitary sewers which carry only sewage, and separate storm sewers which take care of the runoff from rain and snow. The water released from the storm sewers is often seriously contaminated with oil, dirt, organic matter and chemicals.

Settleable Solids

Most generally, all solids in a liquid that can be removed by stilling the liquid. In the *Imhoff* cone test, the volume of matter in a one-liter sample that settles to the bottom of the cone in one hour. (Water Quality) Bits of debris, sediment, or other solids that are heavy enough to sink when a liquid waste is allowed to stand in a pond or tank. Also see *Settling Chamber* and *Settling Pond*.

Seven-Day 10-Year Low Flow (7Q10)

The period of lowest stream flow during a seven-day interval that is expected to occur once every 10 years. The 7Q10 has a ten percent change of occurring in any given year. During this time of low flow, the amount of *Dissolved Oxygen* in the water would be expected to be the

lowest encountered under normal conditions. Since such conditions are considered to be the worst natural case, the dissolved oxygen levels during such episodes are used to establish *Ambient Water Quality Standards* for that stream.

Sewer

Any pipe or conduit used to carry sewage or storm water to treatment plants or receiving waters.

Sewer, Combined

Sewer that carries both wastewater and storm water. These systems carry away both water polluted by human use and storm runoff from streets and buildings. In a combined sewer system, the interceptors are designed to permit a portion of the sewage to pass directly into the receiving waters when storms cause high runoff. If part of the increased load of water was not diverted, the treatment plant would be overloaded and the purifying process would not function properly.

Sewer, Lateral

A street sewer that serves a limited number of properties and discharges into a trunk sewer.

Sewer, Sanitary

In a system of separated sewers, the pipes that carry wastewater but exclude storm water.

Sewer, Trunk

A sewer that transports wastewater from collecting (lateral) sewers to the treatment plants.

Siltation

The deposition of finely divided soil and rock particles upon the bottom of stream and river beds and in reservoirs.

Sludge

The solids removed from wastewater by sedimentation and precipitation; often presents a problem of ultimate disposal.

Solubility

The relative capacity of a substance to serve as a solute. Sugar has a high solubility in water, whereas gold has a low solubility in water.

Solute

- (1) Any material which is dissolved in another, such as salt dissolved in water.
- (2) Any substance that is dissolved in water.

Species (both Singular and Plural)

A natural population or group of populations that transmit specific characteristics from parent to offspring. They are reproductively isolated from other populations with which they might breed. Populations usually exhibit a loss of fertility when hybridizing.

Specific Conductance

A Measure of the ability of water to conduct an electrical current as measured using a 1-cm cell and expressed in units of electrical conductance, i.e., siemens or micro-siemens (μS or μmho) at 25° C. Specific conductance is related to the type and concentration of ions in solution and can be used for approximating the Total Dissolved Solids (TDS) content of water by testing its capacity to carry an electrical current. Commonly, the concentration of dissolved solids (in milligrams per liter, mg/l) is from 55 to 75 percent of the specific conductances (in micro-siemens, μS). This relation is not constant from stream to stream, and it may vary in the same source with changes in the composition of the water. For comparison, the specific conductance of sea water is approximately 50,000 μS , which is equivalent to a TDS concentration of about

35,000 milligrams per liter (mg/l). (Water Quality) Specific conductance is used in groundwater monitoring as an indication of the presence of ions of chemical substances that may have been released by a leaking landfill or other waste storage or disposal facility. A higher specific conductance in water drawn from *Down-gradient Wells* when compared to *Up-gradient Wells* indicates possible contamination from the facility.

Staff Gage

A graduated scale used to indicate the height of the water surface in a stream channel, reservoir, lake, or other water body.

Stage

The height of a water surface above some established reference point or *Datum* (not the bottom) at a given location. Also referred to as *Gage Height*.

Standards

Norms that impose limits on the amount of pollutants or emissions produced by an activity. The *U.S. Environmental Protection Agency (EPA)* establishes minimum standards, but individual states are allowed to be more strict.

State Waters

Means any body of water, irrigation or drainage system, either surface or underground. This does not include irrigation waters where the waters are used up within the irrigation system and said waters are not returned to any other State Waters. Neither does the term include ponds or lagoons used solely for treating, transporting, or impounding pollutants (MCA 75-5-103).

Suspended Load

- (1) Portion of sediment that moves in suspension.
- (2) All the material transported by a stream or river, neither in contact with the river bottom (*Bed Load*) nor in solution (*Dissolved Load*).

Suspended Sediment

Very fine soil particles which remain in suspension in water for a considerable period of time without contact with the bottom. Such material remains in suspension due to the upward components of turbulence and currents and/or by *Colloidal Suspension*.

Suspended-Sediment Discharge

- (1) The quantity of suspended sediment passing a transect in a unit of time. When expressed in tons per day, it is computed by multiplying water discharge (in cubic feet per second) by the suspended -sediment concentration (in milligrams per liter) and by the factor 0.0027.
- (2) The quantity of sediment moving in suspension, reported as dry weight, that passes a cross section in a given time. It is calculated in units of tons per day as follows: concentration (mg/l) X discharge (cubic feet/second) times 0.0027.

Suspended Solids (SS)

Solids which are not in true solution and which can be removed by filtration. Such suspended solids usually contribute directly to turbidity. Defined in waste management, these are small particles of solid pollutants that resist separation by conventional methods. Suspended solids (along with *Biochemical Oxygen Demand - BOD*) is a measurement of water quality and an indicator of treatment plant efficiency. Also see *Suspended Particulate Matter*.

Symbiosis

Two organisms of different species living together, one or both of which may benefit and neither is harmed.

Synoptic Studies

Short-term investigations of specific water-quality conditions during selected seasonal or hydrologic periods to provide improved spatial resolution for critical water-quality conditions. For the period and conditions sampled, they assess the spatial distribution of selected water-quality conditions in relation to causative factors, such as land use and contaminant sources.

T

Thermal Pollution

The impairment of water quality through temperature increase, usually from discharges of industrial cooling water. While stream temperature is affected naturally, man significantly affects it through construction and operation of dams, and the discharge of cooling waters from industrial processes, particularly power generation.

Time-Weighted Average

Computed by multiplying the number of days in the sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the total number of days. A time-weighted average represents the composition of water that would be contained in a vessel or reservoir that had received equal quantities of water from the stream each day for the year.

Total Coliform Bacteria

A particular group of bacteria that are used as indicators of possible sewage pollution. This group includes coliforms that inhabit the intestine of warm-blooded animals and those that inhabit soils. They are characterized as aerobic or facultative anaerobic, gram-negative, non-spore-forming, rod-shaped bacteria that ferment lactose with gas formation within 48 hours at 35 degrees centigrade. In the laboratory, these bacteria are defined as all the organisms that produce colonies with a golden-green metallic sheen within 24 hours when incubated at 35 degrees centigrade plus or minus one degree centigrade on M-Endo medium (nutrient medium for bacterial growth). Their concentrations are expressed as the number of colonies per 100 ml of sample.

Total Dissolved Solids (TDS)

(Water Quality) A measure of the amount of material dissolved in water (mostly inorganic salts). Typically aggregates of carbonates, bi-carbonates, chlorides, sulfates, phosphates, nitrates, etc., of calcium, magnesium, manganese, sodium, potassium, and other cations which form salts. The inorganic salts are measured by filtering a water sample to remove any suspended particulate material, evaporating the water, and weighing the solids that remain. An important use of the measure involves the examination of the quality of drinking water. Water that has a high content of inorganic material frequently has taste problems and/or water hardness problems. As an example, water that contains an excessive amount of dissolved salt (sodium chloride) is not suitable for drinking. High TDS solutions have the capability of changing the chemical nature of water. High TDS concentrations exert varying degrees of osmotic pressures and often become lethal to the biological inhabitants of an aquatic environment. The common and synonymously used term for TDS is "salt". Usually expressed in milligrams per liter. Also see *Hard Water* and *Salinity*.

Total Solids (TS)

The total solids of a waste. It is determined by evaporation of a sample and weighing the remaining material after drying by heating about 103° C. The pollutional effect of TS is the depletion of dissolved oxygen in surface waters in oxidation of the oxidizable portion of the total solids.

Toxic Pollutants

A pollutant or combination of pollutants including disease-causing agents, which after discharge and upon exposure, ingestion, inhalation or assimilation into any organism either directly or indirectly cause death, disease, cancer, genetic mutations, physiological malfunction (including malfunctions in reproduction), and physical deformations in such organisms or their offspring (PL 92-500). Toxic materials may include hundreds of compounds present in various waters, such as industrial waste discharges or runoff from where pesticides have been applied.

Toxicity

(1) The ability of a chemical substance to cause acute or chronic adverse health effects in animals, plants, or humans when swallowed, inhaled or absorbed.

(2) The occurrence of lethal or sub-lethal adverse effects or representative, sensitive organism due to exposure to *Toxic Materials*. Adverse effects caused by conditions of temperature, dissolved oxygen, or non-toxic dissolved substances are excluded from the definition of toxicity.

Trickling Filter

See secondary treatment.

Treatment Works

Those constructions or devices, individually or collectively, except sewers, used for collecting, pumping, treatment, or disposing of wastewaters or for the recovery of by-products from such wastewater.

Turbidity

Is an expression of the optical property of a sample of water which causes light to be scattered and absorbed rather than transmitted in straight lines through the sample. Excessive turbidity reduces light penetration into the water and, therefore, reduces photosynthesis by phytoplankton organisms, attached algae, and submersed vegetation. Turbidity is caused by the presence of suspended matter such as clay, silt, finely divided organic matter, bacteria, plankton, and other microscopic organisms. The standard instrument for measuring turbidity is the Jackson Candle Turbidimeter. Measurements of turbidity are expressed as Jackson Turbidity Units (JTU).

U**Unbiased Sample**

(Statistics) A sample is said to be unbiased if its behavior and characteristics are representative of the total *Population*.

V**Vacuum Filtration**

(Water Quality) A process by which liquid is extracted from a sludge. The filtrate is forced through a filtering material by means of a vacuum.

Volatile Solids (VS)

The portion of total solids which is driven off as volatile gases when heated to 600° C. for one hour. Usually, measured as lbs. VS per day or as percent of total solids. Volatile solids usually represent 50 to 60 percent of total solids. They are the fraction of total solids contributing to pollution and oxygen depletion of surface waters.

W

Waste Disposal Well

Any natural or man hole, crevasse, fissure or opening in the ground which is used or is intended to be used for the disposal of sewage, industrial wastes or other waste. This disposal practice is not an acceptable method in Montana.

Waste Treatment

The process used to speed up the natural processes by which water purifies itself. This process relies on bacteria that digest the organic matter in the sewage, consuming oxygen in the water in order to do their job. If the sewage load is excessive, the bacteria may consume too much of the Dissolved Oxygen (DO) available in the water, leaving too little to sustain fish and plant life. Low levels of DO also reduce the water's ability to assimilate and purify wastes. This demand for Dissolved Oxygen—the biochemical oxygen demand (BOD)—is used to measure the organic waste load of sewage. It is thus an indication of how well a treatment plant is working; if the plant is overloaded or performing poorly, its effluent will have a high content of organic wastes and therefore a high BOD.

Wastewater

Sewage, industrial waste, or other waste, or any combination of these, whether treated or untreated, plus any admixed land runoff.

Wastewater Source

Any equipment, facility, or other plant source of any type whatsoever which discharges wastewater directly or indirectly (except through a sewer tributary to a treatment works) to the waters of the State.

Water Analysis

The determination of the physical, chemical, and biological characteristics of water. Such analysis usually involved four kinds of examination: bacterial, chemical, microscopic, and physical.

Water Color

One of the most immediately apparent attributes of many natural waters and one that, together with visual clarity, strongly influences human aesthetic perception and recreational use. Color of waters is a guide to their composition, and remote sensing of water color is increasingly being used to infer water quality, particularly suspended solids and phytoplankton concentrations. The color of water, with water considered a translucent (i.e., not transparent) material, is commonly associated with transmitted light, for example, the color seen by a diver beneath the water's surface. However, the color of natural waters as observed from above is that associated with the upwelling light field that results from back scattering of sunlight illuminating the water volume. In this manner, the color of natural waters can be objectively specified, using their spectral *Reflectance*, where the reflectance is defined as the ratio of the upwelling light to incident (downwelling) light.

Water Quality

(1) A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

(2) The chemical, physical, and biological condition of water related to beneficial use. Also see *Drinking Water Standards* and *Drinking Water Standards [Nevada]*. [See Appendix B-9 for principal threats to water quality.]

Water Quality Criteria

A specific level or range of levels of water quality necessary for the protection of a water use; levels of water quality expected to render a body of water suitable for its designated use. The criteria are set for individual pollutants and are based on different water uses, such as a public water supply, an aquatic habitat, an industrial supply, or for recreation.

Water Quality Standard

(1) A plan for water quality management containing four major elements: water use; criteria to protect uses; implementation plans, and enforcement plans. An anti-degradation statement is sometimes prepared to protect existing high quality water sources.

(2) State-adopted and U.S. *Environmental Protection Agency (EPA)* approved ambient standards for water bodies. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect designated uses.

Weighted Average

(1) (Data Analysis) For a series of recorded observations, the sum of the products of the frequency of certain values and the value of the observation, divided by the total number of observations. For example, for one measurement of five grams, three measurements of seven grams, and two measurements of two grams, the weighted average is $[1(5) + 3(7) + 2(2)]/6 = 5$ grams.

(2) (USGS) Used to indicate discharge-weighted average. It is computer by multiplying the discharge for a sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the sum of the discharges. A discharge weighted average approximates the composition of water that would be found in a reservoir containing all the water passing a given location during the water year after thorough mixing in the reservoir.

Wetted Perimeter

The length of the wetted contact between a stream of flowing water and its containing conduit or channel, measured in a plane at right angles to the direction of flow.

Z**Zooplankton**

(1) Small, usually microscopic animals found in lakes and reservoirs that possess little or no means of propulsion. Consequently, animals belonging to this class drift along with the currents.

(2) The animal part of the plankton. Zooplankton are capable of extensive movements within the water column and are often large enough to be seen with the un-aided eye. Zooplankton are secondary consumers feeding upon bacteria, phytoplankton, and detritus. Because they are the grazers in the aquatic environment, the zooplankton are a vital part of the aquatic food web. The zooplankton community is dominated by small crustaceans and rotifers.