T

Tacking — The binding of *Mulch* fibers by mixing them with an adhesive chemical compound during land *Restoration* projects.

Tafoni — Natural cavities in rocks formed by weathering.

Tahoe–Prosser Exchange Agreement [California-Nevada] — Also referred to as the "Agreement for Water Exchange Operations of Lake Tahoe and Prosser Creek Reservoir," this agreement was finalized in June 1959 and designated certain waters in Prosser Reservoir in the Truckee River Basin as "Tahoe Exchange Water." By this agreement, when waters were to be released from Lake Tahoe for a minimum instream flow (50 cfs winter; 70 cfs summer) and when such releases from Lake Tahoe were not necessary for *Floriston Rates* due to normal flows elsewhere in the river, then an equal amount of water (exchange water) could be stored in Prosser Reservoir and used for releases at other times. Also see *Truckee River Agreement [Nevada and California]*.

Tahoe Regional Planning Agency (TRPA) [Lake Tahoe – California and Nevada] — A bi-state regulatory agency created in July 1968 as part of a provisional California–Nevada Interstate Compact developed by the joint California–Nevada Interstate Compact Commission which was formed in 1995. The TRPA was the first bi-state regional environmental planning agency in the United States. The TRPA was intended to oversee land-use planning and environmental issues within the Lake Tahoe Basin and is dedicated to preserving the beauty of the region. Today, the TRPA leads the cooperative effort within the basin to preserve, restore, and enhance the unique natural and human environment of the region and is a leading partner in a comprehensive program which monitors water quality, air quality, and other threshold standard indicators. The TRPA's Environmental Thresholds Carrying Capacities (ETCC) programs are designed to address the following thresholds:

- Water Quality
- Air Quality
- Soil Conservation
- Vegetation
- Fisheries
- Wildlife
- Scenic Resources/Community Design
- Recreation
- Noise

The structure of the TRPA consists of a 15-member Governing Board which sets TRPA policy, oversees administration of the agency, approves all amendments to the Lake Tahoe Basin Regional Plan and reviews major project applications. The Governing Board is advised by a 19-member Advisory Planning Commission made up of area planning and natural resource management professionals, and lay persons. The Executive Director directs approximately 50 staff members in the following principal functional areas: (1) Environmental Education; (2) Environmental Improvement Program (EIP) Facilitation; (3) Environmental Compliance Division; (4) Project Review Division; and (5) Long Range Planning Division. Representation on the TRPA's Governing Board is as follows:

[1] Governor of California Appointee (California);
[2] Governor of California Appointee (California);
[3] California Assembly Speaker Appointee (California);
[4] California Senate Rules Committee Appointee (California);
[5] El Dorado County Appointee (California);
[6] Placer County Appointee (California);
[7] City of South Lake Tahoe Appointee (California);
[8] Governor of Nevada Appointee (Nevada);
[9] Nevada Government Appointee (Nevada);
[10] Nevada Department of Conservation & Natural Resources Appointee (Nevada);
[11] Washoe County Appointee (Nevada);
[12] Douglas County Appointee (Nevada);

[13] Carson City Appointee (Nevada);
[14] Nevada at-Large Appointee (Nevada);
[15] Presidential Appointee (United States)

In late 1995 the TRPA created the Shorezone Partnership Committee of 20 organizations and entities to lessen the problems among those interested in the future development of Lake Tahoe. Those represented included: California and Nevada state lands; California and Nevada state parks, California Department of Fish and Game, California Tahoe Conservancy, Lahontan Regional Water Quality Control Board; League to Save Lake Tahoe; Nevada Division of Wildlife; Tahoe Lakefront Owners Association; TRPA; Tahoe Research Group; Tahoe–Sierra Preservation Council; U.S. Army Corps of Engineers; U.S. Forest Service; commercial property owners; Lake Tahoe marinas; Lake Tahoe tour-boat operators; other private property owners; and Lake Tahoe Basin recreation concessionaires.

Taiga — A subarctic, evergreen coniferous forest of northern Eurasia located just south of the *Tundra* and dominated by firs and spruces. Also referred to as a *Boreal Forest*. Also see *Biome*.

Tailings — The waste material remaining after metal is extracted from ore.

Tailrace — (1) The part of a *Millrace* below the water wheel through which the spent water flows; the channel which conducts water away from a water wheel. (2) A channel for floating away mine tailings and refuse. (3) A race for conveying water away from a point of industrial application (as a waterwheel or turbine) after use.

Tail Water — (1) In *Hydraulics*, water, in a river or channel, immediately downstream from a structure. (2) In *Irrigation*, water that reaches the lower end of a field; excess surface water draining especially from a field under cultivation. Tail water is not necessarily lost; it can be collected and reused on the same or adjacent fields.

Tailwater Recovery — The process of collecting irrigation water runoff for reuse in the system.

Tailwater Runoff — Refers to unused irrigation water or rain water that is collected at the base or at the end of an irrigation system or field in a ditch or other impoundment. This water may be reused again for irrigation purposes, left to evaporate, percolate into the ground, treated, and/or discharged to surface bodies of water.

Tank — An artificial pool, pond, reservoir, cistern, or large container for holding and storing water for drinking or irrigation.

Tap — A valve and spout used to regulate delivery of a fluid at the end of a pipe.

Tapered Aeration — A modification of the activated sludge process wherein air is introduced at a higher rate at the head of the tank than in subsequent sections.

Tap Water — Water withdrawn directly from a tap or faucet.

Taproot — A main root that grows straight down. Taproots can go very deep if there is a lack of soil moisture near the surface.

Tar Balls — Non-volatile hydrocarbon clumps remaining in water after the volatile fractions have evaporated from crude oil that has been discharged or spilled into the marine environment. When washed ashore, these residues, which range in size from marbles to beach balls, spoil beaches and marine habitat.

Tarn — A small steep-banked mountain lake or pool, generally formed by a glaciation process.

Taxonomy — (1) The science, laws, or principles of classifying living organisms in specially named categories based on shared characteristics and natural relationships. (2) The division of biology concerned with the classification and naming of organisms. The classification of organisms is based upon a hierarchial scheme beginning with Kingdom and ending with Species at the base. The higher the classification level (i.e., going from kingdom to species), the fewer features the organisms have in common. For example, the taxonomy of the Lahontan cutthroat trout (LCT), *Oncorhynchus clarki henshawi*, is the following:

Kingdom	Animal
Phylum	Chordata
Class	Osteichthyes
Order	Salmoniformes
Family	Salmonidae
Genus	*Oncorhynchus*
Species	*clarki*
Subspecies	*henshawi*

TCID — See *Truckee–Carson Irrigation District (TCID) [Nevada]*.

TDS (Total Dissolved Solids) — All the solids (usually mineral salts) that are dissolved in water. Used to evaluate water quality.

Technology-Based — Describing emission or effluent limitations that are not defined in terms of allowable releases that achieve a desirably low ambient pollutant concentration, but instead are based on the pollutant control

efficiency that is achievable using current levels of technology.

Technology-Based Limitations — (EPA) Industry-specific effluent limitations applied to a discharge when it will not cause a violation of water quality standards at low stream flows. Usually applied to discharges into large rivers.

Technology-Based Standards — (EPA) Effluent limitations applicable to direct and indirect sources which are developed on a category-by-category basis using statutory factors, not including water-quality effects.

Technology-Forcing — Describing standards or levels of pollution and effluent control called for in environmental statutes or regulations for which existing technologies are inadequate and therefore require technical advancements to achieve.

Teleconnection — (Meteorology) A term which describes the influence of an aberration in weather patterns in one part of the world to cause strange weather in another area of the globe. Also see *El Niño, El Niño/Southern Oscillation (ENSO),* and *Hurricane Forecasting*.

Temperate (Deciduous) Forest — Forested areas characterized by moderate temperatures, weather, or climate, and rainfall from 30 to 60 inches per year. These forests are found in eastern North America, eastern Australia, western, central, and eastern Europe, and parts of China and Japan. Typical deciduous trees in the North American deciduous forests are oak, hickory, maple, ash, and beech. Also see *Biome*.

Temperature — The degree of hotness or coldness. Also, a measure of the average energy of the molecular motion in a body or substance at a certain point.

Temperature Gradient — The rate of change of temperature with increase in height or decrease in depth.

Temperature Inversion — A surface cooling at the earth's surface which sometimes leads to an increase in temperature with altitude.

Temperature Regulation — The processes through which an organism's temperature is adjusted to certain metabolic requirements or conditions in its environment. For example, the act of human perspiration promotes surface skin evaporation which cools the body.

Temperature Scale — The temperature scale adopted by a 1960 international conference was based on a fixed temperature point, the *Triple Point* of water, at which the solid, liquid, and gas are in equilibrium. The temperature of 273.16 K (Kelvin) was assigned to this point. The freezing point of water was designated as 273.15 K, equaling exactly 0° on the *Celsius Temperature Scale*. The Celsius scale, which is identical to the *Centigrade Temperature Scale,* is named for the 18th-century Swedish astronomer Anders Celsius, who first proposed the use of a scale in which the interval between the freezing and boiling points of water is divided into 100 degrees. By international agreement, the term Celsius has officially replaced Centigrade.

Tempest — A violent windstorm, frequently accompanied by rain, snow, or hail.

Temporary Hardness — Water hardness that can be reduced or removed by heating the water. Heating drives off carbon dioxide, shifting the carbonate buffer system equilibrium so that carbonate ions combine with dissolved calcium or magnesium ions, form solids, and precipitate. This lowers the calcium/magnesium ion water concentration, lowering the hardness. Also referred to as *Carbonate Hardness*. Also see *Ion Exchange*.

Temporary Transfer — The transfer of a water right from one purpose to another for a specifically designated period of time.

Temporary Wetland — A type of *Wetland* in which water is present for only part of the year, usually during the wet or rainy seasons (e.g., spring). Also referred to as *Vernal Pools*.

Tenaja — Pools in seasonal streams that may support a flora similar to *Vernal Pools* upon desiccation.

Tensiometer — An instrument used for measuring the suction or negative pressure of soil water.

Tennessee Valley Authority (TVA) — A Depression-era federal government project created in 1933 to control and harness the Tennessee River and its tributaries. The TVA became perhaps the best known of President Franklin Roosevelt's "New Deal" public works projects. The TVA currently operates 47 dams, 11 coal-fired and 2 nuclear power plants, and an extensive power transmission system. The Tennessee Valley Authority Power System encompasses the state of Tennessee and parts of the states of Kentucky, Virginia, North Carolina, Georgia, Alabama, and Mississippi, and borders the Mississippi River on the west.

Tephra — (Geology) Volcanic material; ash-fall.

Teratogenic — Causing birth defects.

Terminal Lake — A lake with no outlet.

Terminal Moraine — Constitutes the material (*Glacial Till*) left behind by the farthest advance of a Glacier's toe. Each different period of glaciation leaves behind its own uniquely developed moraines. Also see *Moraines, Lateral Moraines,* and *Recession Moraine*.

Terminal Spill — Refers to those releases made at the terminal ends of the project conveyance or reservoir system. These canal or reservoir releases are not reused on the project's improved irrigated acreage. Also see *Operational*

Spill.

Terminal Velocity — The final velocity of falling solid particles in water or in air or of raindrops in air.

Terminal (Settling) Velocity — For a particle falling in a nonturbulent fluid (liquid or gas), the maximum possible velocity reached when the drag, or frictional resistance, on the particle equals the gravitational force on the particle. The measure is used in the design of chambers in which particles are removed from air or from water by gravitational settling. The horizontal flow rate through the chamber must allow time for the particles to reach the bottom of the *Settling Chamber*.

Terminus — Refers to the location of water's final destination, as in the terminus of a river system being a *Terminal Lake*.

Terrace — (1) (Erosion and Irrigation) An embankment or combination of an embankment and channel constructed across a slope to control erosion by diverting and temporarily storing surface runoff instead of permitting it to flow uninterrupted down the slope. Outlets may be soil infiltration only, vegetated waterways, tile outlets, or combinations thereof. (2) (Geological) An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide. (3) Also, a *Berm* or discontinuous segments of a berm, in a valley at some height above the *Flood Plain*, representing a former abandoned flood plain of the stream.

Terracing — A series of levels on a hillside, one above the other; dikes built along the contour of sloping farm land that hold runoff and sediment to reduce erosion. Hillside farming on terraces greatly reduces water erosion of soil.

Terraqueous — Composed of land and water.

Terrestrial — Living or growing on land rather than in water or air.

Terrigenous — Derived from or originating on the land (usually referring to sediments) as opposed to material or sediments produced in the ocean (marine) or as a result of biologic activity (biogenous).

Territorial Waters — (Legal) (1) The waters under the sovereign jurisdiction of a nation or state including both marginal sea and inland waters. (2) In international law, waters subject to the jurisdiction of a sovereign nation, as distinguished from *High Seas*, and consisting of waters within the nation, waters that are boundaries between nations, and coastal waters. Such jurisdiction extends also to the air space above and to the bed beneath those waters. Jurisdiction over boundary waters, such as lakes or rivers, is fixed by treaties; the limit of the jurisdiction of each nation is usually an imaginary line drawn through the center of such waters. In the United States each state exercises jurisdiction over waters wholly within the state, but streams forming part of the system of interstate waterways are subject to federal government control. Also see *Interstate Compact*.

Tertiary Wastewater Treatment — Selected biological, physical, and chemical separation processes to remove organic and inorganic substances that resist conventional treatment practices; the additional treatment of effluent beyond that of primary and secondary treatment methods to obtain a very high quality of effluent. The complete wastewater treatment process typically involves a three-phase process: (1) First, in the *Primary Wastewater Treatment* process, which incorporates physical aspects, untreated water is passed through a series of screens to remove solid wastes; (2) Second, in the *Secondary Wastewater Treatment* process, typically involving biological and chemical processes, screened wastewater is then passed a series of holding and aeration tanks and ponds; and (3) Third, the *Tertiary Wastewater Treatment* process consists of flocculation basins, clarifiers, filters, and chlorine basins or ozone or ultraviolet radiation processes. Tertiary techniques may also involve the application of wastewater to land to allow the growth of plants to remove plant nutrients.

Test Hole (Test-Well) — (Hydraulics) A well hole drilled for experimental or exploratory purposes.

(Local) Test-Well Site Designation [Nevada] — The local test-well site designation used in Nevada is based on the identification of a site by hydrographic area and by the official rectangular subdivision of the public lands referenced to the Mount Diablo (located east of Walnut Creek, California) base line and meridian and is based on the *Public Land Survey System (PLSS)*. Each site designation consists of four units: The first unit is the hydrographic area number. The second unit is the township, preceded by an N or S to indicate location north or south of the base line. The third unit is the range, preceded by an E to indicate location east of meridian. The fourth unit consists of the section number and letters designating the quarter section, quarter-quarter section, and so on (A, B, C, and D indicate the northeast, northwest, southwest, and southeast quarters, respectively), followed by a number indicating the sequence in which the site was recorded. For example, site 210 S12 E63 29DABC2 is in Coyote Spring Valley (Nevada Hydrographic Area 210). It is the second site recorded in the southwest quarter (C) of the northwest quarter (B) of the northeast quarter (A) of the southeast quarter (D) of Section 29, Township 12 South, Range 63 East, Mount Diablo base line and meridian.

Test-Well Site Identification (U.S. Geological Survey) — The standard *U.S. Geological Survey (USGS)* site

identification is based on the grid system of latitude and longitude. The number consists of 15 digits. The first six digits denote the degrees, minutes, and seconds of latitude; the next seven digits denote degrees, minutes, and seconds of longitude; and the last two digits (assigned sequentially) identify the sites within a 1–second grid. For example, site 365227114554401 is at 36°52′27″ latitude and 114°55′44″ longitude, and it is the first site recorded in that 1–second grid. The assigned number is retained as a permanent identifier even if a more precise latitude and longitude are later determined. Also see *(Local) Test-Well Site Designation [Nevada]*.

Tetrachloroethylene (Perchloroethylene, PCE) — A solvent often used for degreasing and in dry cleaning which sometimes makes its way into water wells and other ground water supplies. Studies have shown that high concentrations of the chemical can cause liver and kidney damage, including cancer, in animals. In humans, however, not enough information is available to say it is a definite carcinogen. The *U.S. Environmental Protection Agency's (EPA)* safe drinking water standard for tetrachloroethylene is 0.005 parts per million (ppm). Also referred to as *Perchloroethylene (PCE)* and *Perclene*.

Texture — Refers to relative proportions of clay, silt, and sand in soil.

Thalweg — (1) The line connecting the deepest points along a stream. (2) The lowest thread along the axial part of a valley or stream channel. (3) A subsurface, ground-water stream percolating beneath and in the general direction of a surface stream course or valley. (4) The middle, chief, or deepest part of a navigable channel or waterway.

Thank-You-Ma'am — (Derived from its causing a nodding of the head] A bump or depression in a road; especially a ridge or hollow made across a road on a hillside to cause water to run off and thereby minimize erosion. Also known as a *Water Break*.

Thatch — Dead stems that build up beneath certain ground covers and lawn grasses, sometimes becoming so thick and compressed as to impede infiltration by water.

Thaw — (1) To change from a frozen solid to a liquid by gradual warming. Synonymous with *Melt*. (2) To become warm enough for snow and ice to melt. (3) A period of warm weather during which ice and snow melt.

Theoretical Oxygen Demand (ThOD) — The amount of oxygen that theoretically is required to totally oxidize a substance.

Thermal — Having to do with heat, as a hot spring (*Thermal Spring*).

Thermal Gradient — A temperature difference between two areas.

Thermal Mass — Materials that absorb heat or coolness and store it for a long period of time. Water and masonry materials can provide thermal mass. Such materials react slowly to temperature variations and are important aspects of any passive heating or cooling system.

Thermal Plant — A power generating plant which uses heat to produce energy. Such plants may burn fossil fuels or use nuclear energy to produce the necessary thermal energy.

Thermal Plume — The hot water discharged from a power generating facility or other industrial plant. When the water at elevated temperature enters a receiving stream or body of water, it is not immediately dispersed and mixed with the cooler waters . The warmer water moves as a single mass (plume) downstream from the discharge point until it cools and gradually mixes with that of the receiving stream. Also see *Thermal Pollution*.

Thermal Pollution — The influx of heated water, usually from a power plant, wastewater from a factory or sewage treatment plant, or the discharge of other industrial cooling water, into a stream, lake, bay, or ocean, disturbing the temperature of the given body of water. The resulting shift to a warmer aquatic environment can cause a change in species composition and lower the dissolved oxygen content of the water. Also has application to air, through waste heat emitted by industry, home appliances, machines, etc.

Thermal Spring — A spring that brings warm or hot water to the surface. Sometimes called warm spring, or hot spring. Temperature usually 15°F (9.4°C) or more above mean air temperatures.

Thermal Stratification — The vertical temperature stratification of a lake or reservoir which consists of: (a) the upper layer, or *Epilimnion*, in which the water temperature is virtually uniform; (b) the middle layer, or *Thermocline*, in which there is a marked drop in temperature per unit of depth; and (c) the lowest stratum, or *Hypolimnion*, in which the temperature is again nearly uniform.

Thermocline — (1) The region in a thermally stratified body of water which separates warmer oxygen-rich surface water from cold oxygen-poor deep water and in which temperature decreases rapidly with depth. (2) A layer in a large body of water, such as a lake, that sharply separates regions differing in temperature, so that the temperature gradient across the layer is abrupt. (3) The intermediate summer or transition zone in lakes between the overlying *Epilimnion* and the underlying *Hypolimnion*, defined as that middle region of a thermally stratified lake or reservoir in which there is a rapid decrease in temperature with water depth. Typically, the temperature decrease reaches 1°C or more for each meter of descent (or equivalent to 0.55°F per foot).

Thermoelectric Power — Electrical power generated using fossil-fuel (coal, oil, or natural gas), geothermal, or

nuclear energy.

Thermoelectric Power Water Use — Water used in the process of the generation of *Thermoelectric Power*. The water may be obtained from a Public Water Supply System or may be self supplied. Also see *Self-Supplied Water*.

Thermograph — A self-registering thermometer which has a thermometric element consisting either of a bimetallic strip or a metal tube filled with alcohol or mercury, and makes an autographic record on a ruled chart wrapped around a clock-driven cylinder.

Thickener — A *Settling Pond* or tank where the concentration of solids is increased by allowing settling and the removal of clarified liquid. The solids that are pumped from the bottom of the pond or tank are much thicker than the incoming fluid.

Thiokol — A trademark used for any of various polysulfide polymers in the form of liquids, water dispersions, and rubbers used in seals and sealants.

Third Party (Parties) — The people, communities, and environments not directly engaged in a transfer of water or water rights (i.e., the buyers or sellers) but still affected by the transfer. These affected parties can include areas of origin, Indian tribes, other minority cultures and peoples, communities that depend on irrigated agriculture or water-based recreation, boaters, anglers, and broad segments of the public who care about wetlands, riparian areas, endangered species, instream (minimum) flows, aesthetics, and other environmental values that might be hared or enhanced by a change in water use.

Third-Party Impacts — Direct and indirect economic, social or environmental effects of a water transfer to a party other than the seller or buyer.

Threatened Species — Any plant or animal species likely to become an "endangered" species within the foreseeable future throughout all of a significant area of its range or natural habitat; identified by the Secretary of the Interior as "threatened", in accordance with the 1973 *Endangered Species Act (ESA)*. [See Appendix D–1, Nevada's Endangered and Threatened Species.]

Three-Mile Limit — The limit of the marginal sea of three miles included in the territorial waters of a state.

Threshold Odor Number (TON) — A value indicative of the maximum dilution which can be made of a sample with its odor remaining detectable. A higher *TON* indicates a stronger odor.

Threshold Pollutant — A substance that is harmful to a particular organism only above a certain concentration, or threshold level.

Throughfall — In a vegetated area, the precipitation that falls directly to the ground, or the rainwater or snowmelt that drops from twigs or leaves.

Thunder — The crashing or booming sound produced by rapidly expanding air along the path of the electrical discharge of lightning.

Thunderbird — (Mythology) A spirit of thunder, lightning, and rain in the form of a huge bird in the mythology of certain Native American peoples.

Thundercloud — A large dark cloud charged with electricity and producing thunder and lightning; A *Cumulonimbus* cloud. See *Cloud*.

Thunderhead — A round mass of *Cumulus Clouds* appearing before a *Thunderstorm*.

Thundershower — A shower accompanied by thunder and lightning.

Thundersquall — A squall accompanied by thunder and lightning.

Thunderstorm — A storm accompanied by thunder and lightning.

Tidal Marsh — Low, flat marshlands traversed by interlaced channels and tidal sloughs and subject to tidal inundation. Typically, the only vegetation present is salt-tolerant bushes and grasses (*Halophytes*).

Tidal Energy — The mechanical energy associated with the rising and falling of water level during the movement of the tides. Also see *Tidal Power*.

Tidal Flat — (1) An extensive flat tract of land alternatively covered and uncovered by the tide, and comprising mostly unconsolidated mud and sand. (2) Saltwater wetlands that are characterized by mud and/or sand. Tidal flats often occur at the seaward edges of salt marshes. They're covered with seawater during high tide and become exposed during low tide. Algae are the dominant plants in tidal flats. Also referred to as *Tide Flat*.

Tidal Marsh — A low elevation marshy coastal area formed of mud and the root mat of *Halophytic* plants, regularly inundated during high tide.

Tidal Power — A form of power obtained from the filling and emptying of a *Bay* or an *Estuary* that can be closed by a dam. The enclosed basin is allowed to fill and empty only during brief periods at high and low tides in order to develop as much power as possible.

Tidal Volume — The volume of water entering and leaving a bay or salt marsh as the water level fluctuates because of the tides.

Tidal Wave — (1) An unusual rise or incursion of water along the seashore, as from a storm or a combination of wind and spring tide. (2) A *Tsunami*; a huge sea wave caused by a great disturbance under an ocean, as a strong earthquake or volcanic eruption. (3) An overwhelming manifestation; a flood.

Tide Cycle — The duration of a given tidal sequence, as for example, a lunar month or a tidal day.

Tide Gate — A swinging gate on the outside of a drainage conduit from a diked field that excludes water at high tide and permits drainage at low tide.

Tideland — (1) Land overflowed during flood tide. (2) Land underlying the ocean and lying beyond the low-water limit of the tide but being within the territorial waters of a nation. Often used in the plural.

Tideland (or Tidal) Flooding — The periodic flooding of *Tidelands* during extremely high tides coupled with strong winds and/or high river stages flowing out over a high tide.

Tidemark — A line or an artificial indicator marking the high-water or low-water limit of the tides.

Tide Pool — Habitat in the rocky intertidal zone that retains some water at low tide.

Tides — The alternate rising and falling of the surface of oceans, and of seas, gulfs, bays, rivers, and other water bodies caused by the gravitational attraction of the moon and sun occurring unequally on different parts of the earth. The tide ebbs (falls) and flows (rises) twice in each lunar day (24 hours and 51 minutes). It is occasioned by the attraction of the sun and the moon (the tide-raising force of the latter being three times that of the former), acting unequally on the waters in different parts of the earth, thus disturbing their equilibrium. High tide upon one side of the earth (*Direct Tide*) is accompanied by high tide upon the other side (*Opposite Tide*). Therefore, when the sun and the moon are in conjunction or opposition, as at the new moon and the full moon, their combined action produces a tide greater than usual, called *Spring Tide*. When the moon is at first or third quarter, the sun's attraction in part counteracts the moon's, causing a smaller high tide than usual (and a higher low tide), called *Neap Tide*. The flow or rising of the water is called *Flood Tide*; the reflux, *Ebb Tide*. Also see *Spring Tide* and *Neap Tide*.

Tidewater — (1) Water that inundates land at flood tide. (2) Water affected by the tides, especially tidal streams. (3) Low coastal land drained by tidal streams.

Tile Drainage — Land drainage by means of a series of tile lines laid at a specific depth and grade.

Till (Glacial) — Till is the mixture of rocks, boulders, and soil picked up by a moving *Glacier* and carried along the path of the ice advance. The glacier deposits this till along its path — on the sides of the ice sheet, at the toe of the glacier when it recedes, and across valley floors when the ice sheet melts. These till deposits are akin to the footprint of a glacier and are used to track the movement of glaciers. These till deposits can be good sources of ground water, if they do not contain significant amounts of impermeable clays. Also see *Moraines*, *Lateral Moraines*, and *Terminal Moraines*.

Tillage — Plowing, seedbed preparation, and cultivation practices.

Tilth — (1) The general physical condition of soil as it relates to agriculture use. (2) Land used for agriculture, as opposed to pasture or forest.

Tilting Gate — (Hydraulics) A hinged gate counterbalanced by weights, that automatically opens and closes with a change in head.

Time-Domain Electromagnetics (TDEM) — (Geophysics) A high technology form of *Dowsing (Dousing)*, or groundwater exploration, used to search for underground bodies of water (aquifers). The technique employs a grid pattern of electric wires placed on the surface of the ground. The wires are charged with a rapidly pulsating electric current and then the resultant electronic "echoes" are carefully analyzed. These data are then used to construct a three-dimensional computer model of the water-bearing potential of underground rock formations and sediment layers.

Time of Concentration — The time required for water to flow from the farthest point on the water shed to the gaging station, culvert, or other point of interest.

Time of Travel (TOT) — The time required for a contaminant to move in the *Saturated Zone* from a specific point to a well.

Time-Series Analysis — (Statistics) Techniques that attempt to predict the future by using historical data rather than by building cause-and-effect models. Typically, such techniques are most appropriate when the historical data is relatively well behaved and when forecasts, primarily, are sought and not precise cause-and-effect relationships. Contrast with *Cross-Sectional Analysis*.

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.

Title — The right of property, also the legal evidence of one's right of property.

Titrant — A solution of known strength or concentration; used in *Titration*.

Titration — (Chemistry) (1) A method, or the process, of determining the strength of a solution, or the concentration of a substance in solution, in terms of the smallest amount of it required to bring about a given effect in reaction with another known solution or substance, as in the neutralization of an acid by a base. (2) A process whereby a solution of known strength (the *Titrant*) is added to a certain volume of treated sample containing an indicator. A color change shows when the reaction is complete (the end point).

Titrator — An instrument, usually a calibrated cylinder (tube-form), used in *Titration* to measure the amount of *Titrant* being added to the sample.

Toe — (1) The downstream edge at the base of a dam. (2) The break in slope at the foot of a stream bank where the bank meets the bed. (3) The line of a natural or fill slope where it intersects the natural ground. (4) The lowest edge of a backslope of a cut where it intersects the roadbed or bench.

Toe Drain and Outfall — A drainage conduit from a dam's structure used to carry seepage water away from the dam and can allow seepage quantities to be measured.

Toe Wall — The downstream wall of a structure.

Toeslope — The lowermost portion of the footslope component of an erosional slope. It is distinguished from the upper footslope by a greater accumulation of pedisediment. Also, the lowermost, most gently sloping portion of any slope.

Toilet — A room, shelter, or similar device used for defecation or urination equipped with a bowl-shaped fixture for this purpose fitted with a device for flushing with water.

Toilet Water — A scented liquid with a high alcohol content used in bathing or applied as a skin freshener.

Tonnage — The number of tons of water that a ship displaces when afloat.

Tons per Acre-Foot — The dry mass of dissolved solids in 1 acre-foot of water. It is computed by multiplying the concentration of the constituent, in milligrams per liter (mg/L), by0.00136.

Tons per Day — The rate representing a mass of 1 ton of a constituent in streamflow passing a cross section in 1 day. It is equivalent to 2,000 pounds per day, or 0.9072 metric tons per day.

Top of Bank — The break in slope between the bank and the surrounding terrain.

Top of Dam — The elevation of the uppermost surface of a dam excluding any parapet wall, railings, etc.

Topographic Apex — The head or highest point on an active alluvial fan.

Topographic Maps — Maps with lines showing equal elevation or a region's relief; also showing natural and man-made surface features, including hills, valleys, rivers, and lakes; and man-made features such as canals, bridges, roads, cities, etc.

Topography — The general configuration of the land surface including relief and position of natural and man-made features.

Topside — (Nautical) The surface of a ship's hull above the water line.

Tornado — (1) A rotating column of air usually accompanied by a funnel-shaped downward extension of a Cumulonimbus Cloud and having a Vortex several hundred yards in diameter whirling destructively at speeds of up to 500 miles per hour (800 kilometers per hour). (2) A violent thunderstorm in western Africa or nearby Atlantic waters. (3) A whirlwind or hurricane. Also referred to as a twister. Scientists rank a tornado's intensity and estimate its wind speed based on observed damage, using a scale developed by the late University of chicago researcher Tetsuya Theodore Fujita. The rankings are as follows:

[1] ***FO: Gale Tornado*** – Wind speed: 40-72 miles per hour. Damage: Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages signs.

[2] ***F1: Moderate Tornado*** – Wind speed: 73-112 miles per hour. Damage: Peels roof coverings; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.

[3] ***F2: Significant Tornado*** – Wind speed: 113-157 miles per hour. Damage: Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light objects become missiles.

[4] ***F3: Severe Tornado*** – Wind speed: 158-206 miles per hour. Damage: Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forests uprooted.

[5] ***F4: Devastating Tornado*** – Wind speed: 207-260 miles per hour. Damage: Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown; large missiles generated.

[6] ***F5: Incredible Tornado*** – Wind speed: 261-318 miles per hour. Damage: Strong frame houses lifted

off foundations and carried considerable distances; automobile-size missiles fly thorugh the air for more than 100 meters; trees debarked; steel-reinforced concrete structures badly damaged.

[7] ***F6*** – Although he called it "inconceivable", Fujita left open the possibility a tornado could cause a small area of damage even worse than F5 intensity. But he said evidence of an F6 tornado, with wind speeds up to 379 miles per hour, would probably be masked by damage from surrounding F4 and F5 winds.

On average, only one F5 tornado hits the United States each year. F5 twisters struck in 1999 in Norman, Oklahoma, in 1998 in Waynesboro, Tennessee and Pleasant Grove, Alabama; in 1997 in Jarrell, Texas; in 1996 in Oakfield, Wisconsin; in 1992 in Chandlier, Minnesota; and in 1990 in Plainfield, Illinois, Goessel, Kansas, and Hesston, Kansas. In one of the worst U.S. tornadoes on record, seven F5s struck the Midwest on April 3, 1974, including at Xenia, Ohio.

Torrent — (1) A turbulent, swift-flowing stream. (2) A heavy downpour; a deluge.

Total Carbon (TC) — (Water Quality) A measure of the amount of carbon-containing compounds in water. The measure includes both organic and inorganic forms of carbon as well as compounds that are soluble and insoluble. The typical laboratory analysis involves the conversion of all forms of carbon to carbon dioxide and the subsequent measurement of the carbon dioxide produced. The parameter represents an estimate of the strength of wastewater and the potential damage that an effluent can cause in a receiving stream or other body of water as a result of the removal of *Dissolved Oxygen* from the water. The measurement of total carbon requires less sample, is more rapid, and yields more reproducible results than the measurement of either the *Chemical Oxygen Demand (COD)* or the *Biochemical Oxygen Demand (BOD)*. Also see *Total Organic Carbon (TOC)*.

Total Coliform — The *Escherica coli* and similar gram negative bacteria that are normal inhabitants of fecal discharges. The total coliform group is recognized in the drinking water standards of public health criteria.

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, nonspore-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 1 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 Constituent — The total amount of a given constituent in a representative suspended-sediment sample, regardless of the constituent's physical or chemical form. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent present in both the dissolved and suspended phases of the sample. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to judge when the results should be reported as "total". (Not that the word "total" serves a double meaning here, first indicating that the sample consists of a suspended-sediment mixture and second that the analytical method determined all of the constituent in the sample.)

Total Discharge — The quantity of a given constituent, measured as dry mass or volume, that passes a stream cross section per unit of time. When referring to constituents other than water, this term needs to be qualified, such as "total sediment discharge", "total chloride discharge", etc.

Total Dissolved Solids (TDS) — (Water Quality) A measure of the amount of material dissolved in water (mostly inorganic salts). Typically aggregates of carbonates, bicarbonates, 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 Hardness — The total dissolved salts in water, expressed as total parts of dissolved slats in a million parts of water. Also see *Hard Water*.

Total Head — Energy contained by fluid because of its pressure, velocity, and elevation, usually expressed in feet of fluid (foot-pounds per pound).

Total in Bottom Material — The total amount of a given constituent in a representative sample of bottom material. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent

determined. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to judge when the results should be reported as "total in bottom materia".

Total Inorganic Carbon (TIC) — (Water Quality) The total amount of inorganic salts of carbonates and bicarbonates present in water without regard as to whether the salts are in suspended particulate form or dissolved. Water that contains an excessive amount of these salts is considered to be *Hard Water*. The dissolved materials interfere with the functioning of soaps and detergents and can form adherent scale in boilers, pipes, and steam equipment.

Total Inorganic Nitrogen (TIN) — A measure of the total *Nitrate*, *Nitrite*, and *Ammonia* concentrations of a body of water, typically measured in milligrams per liter (mg/l) or micrograms per liter (µg/l). From the point of view of a planktonic algae, nitrate, nitrite, and ammonia are all very suitable sources of nitrogen for growth. Also see *Carlson's Trophic State Index (TSI)*.

Total Inorganic Phosphate (TIP) — A measure of the concentration of usable phosphorus (soluble *Phosphates*) contained in a body of water. Soluble phosphates readily contribute to algae growth in water. Also see *Carlson's Trophic State Index (TSI)*.

Total Kjeldahl Nitrogen (TKN) — The total concentration of nitrogen in a sample present as ammonia or bound in organic compounds.

Total Load — All of a constituent in transport. When referring to sediment, it includes suspended load plus bed load.

Total Maximum Daily Load (TMDL) — (Water Quality) The maximum quantity of a particular water pollutant that can be discharged into a body of water without violating a water quality standard. The amount of pollutant is set by the *U.S. Environmental Protection Agency (EPA)* when it determines that existing, *Technology-Based* effluent standards on the water pollution sources in the area will not achieve one or more *Ambient Water Quality Standards*. The process results in the allocation of the TMDL to the various *Point Sources (PS)* of pollutants in the area.

Total Organic Carbon (TOC) — (Water Quality) A measure of the amount of organic materials suspended or dissolved in water. The measure is very similar to the assay of the total carbon content; however, samples are acidified prior to analysis to remove the inorganic salts of *Carbonates* and *Bicarbonates*. The assay of total organic carbon represents an estimation of the strength of wastewater and the potential damage that an effluent can cause in a receiving body of water as a result of the removal of *Dissolved Oxygen* from the water. The measurement of total organic carbon requires less sample, is more rapid, and yields more reproducible results than the measurement of either the *Chemical Oxygen Demand (COD)* or the *Biochemical Oxygen Demand (BOD)*. As a pollution indicator, this method is more reliable than the assay of *Total Carbon (TC)* when the wastewater contains high amounts of total inorganic carbon as well.

Total Recoverable Constituent — The amount of a given constituent that is in solution after a representative suspended-sediment sample has been digested by a method (usually using a dilute acid solution) that results in dissolution of only readily soluble substances. Complete dissolution of all particulate matter is not achieved by the digestion treatment, and thus the determination represents something less than the "total" amount (that is, less than 95 percent) of the constituent present in the dissolved and suspended phases of the sample. To achieve comparability of analytical data, equivalent digestion procedures are required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Total Sediment Discharge — The total quantity of sediment passing a section in a unit of time.

Total Sediment Load — The sum of the *Bed Load* and the *Suspended Sediment Load (Discharge)*.

Total Soil Water Potential — The work per unit quantity of pure water that has to be done to change its energy status to that of soil water at the point under consideration. This equals the sum of matric, gravity, pressure, osmotic, and overburden potentials.

Total Solids (TS) — (Water Quality) A measure of the amount of material that is either dissolved or suspended in a water sample, obtained by allowing a known volume to evaporate and then weighing the remaining residue. Total solids equals the sum of the measurements of *Total Dissolved Solids (TDS)* and *Total Suspended Solids (TSS)*.

Total Storage (Reservoir) — The volume of storage below the maximum designed water surface level, including *Dead Storage*.

Total Suspended Particles — A method of monitoring particulate matter by the total weight of a sample of water.

Total Suspended Solids (TSS) — (Water Quality) Solids, found in waste water or in a stream, which can be removed by filtration. The origin of suspended matter may be man-made wastes or natural sources such as silt. Compare to *Total Dissolved Solids (TDS)*.

Total Toxicity — Toxicity as determined by exposing aquatic organisms to samples or dilutions of instream water or treated effluent.

Total Trihalomethanes (TTHMs) — (Water Quality) The sum of the concentrations of individual members of a family of halogenated derivatives of methane in drinking water. The concentrations of the following are employed

to compute the sum in milligrams per liter (mg/l): chloroform ($CHCl_3$), dichlorobromomethane ($CHCl_2Br$), dibromochloromethane ($CHClBr_2$), and bromoform ($CHBr_3$). See *Trihalomethanes (THMs)*.

Total Water Used — Total water withdrawal which does not include recirculation.

Totalizing Meters — A water measuring (headgate or surface tailwater runoff point) device which registers or accumulates total flow (for example, in acre-feet).

Township — A territorial subdivision, generally considered six miles long, six miles wide, and containing 36 *Sections*, each section 1 mile square (640 acres). The Township designation is part of a description of the location of land using the survey system (*Public Land Survey System — PLSS*) of the United States Government and includes the 40–acre subdivision within a *quarter*, *section*, *township* and *range.* The public land survey system is based on the concept of a township as a square parcel of land six miles on each side. Its location is established as being so many six-mile units east of a north-south line (called the *meridian*) and so many six-mile units north or south of an east-west line (called the *baseline*). The township is described by township and range, e.g., T.4N, R.23E. Each township is further divided into 36 parts called sections one mile square (each section measuring 5,280 feet on each side). A typical section contains 640 acres; however, some sections may contain more or less acreage than 640. Also see *Section*.

Township Line — In the generally recognized *U.S. Public Land Survey*, every 24 miles a station is indicated measuring both east and west from a predetermined principal meridian. Similar measurements are also taken north and south from a predetermined base line. In this manner a succession of quadrilaterals are formed, each roughly 24 miles square. Each of these is subdivided into 16 smaller quadrilaterals roughly six miles square. In this system of grid lines, north-south lines become *Range Lines* and east-west lines become *Township Lines*.

Toxaphene — (Water Quality) A chemical that causes adverse health effects in domestic water supplies and is toxic to fresh water and marine aquatic life.

Toxemia — A pathological condition in a person or animal caused by the presence of a toxic substance in the body.

Toxic — (1) Describing a material that can cause acute or chronic damage to biological tissue following physical contact or absorption. (2) Substances that even in small quantities may poison, cause injury, or cause death when eaten or ingested through the mouth, absorbed through the skin or inhaled into the lungs.

Toxicant — Any chemical that has the potential of causing acute or chronic adverse effects in animals, plants, or humans.

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 sublethal adverse effects on representative, sensitive organism due to exposure to *Toxic Materials*. Adverse effects caused by conditions of temperature, dissolved oxygen, or nontoxic dissolved substances are excluded from the definition of toxicity.

Toxicity Characteristic Leaching Procedure (TCLP) — A test that measures the mobility of organic and inorganic chemical contaminants in wastes. The test, designed by the *U.S. Environmental Protection Agency (EPA)*, produces an estimate of the potential for *Leachate* formation by a waste if it is placed in the ground. If the TCLP is applied to a solid waste sample and the extract leached from the waste or the solid waste sample itself contains concentrations of specified materials exceeding allowable levels, the waste is defined as a *Hazardous Waste*, meeting the toxicity characteristic.

Toxic Materials — Any liquid, gaseous, or solid substance or substances in a concentration which, when applied to, discharged to, or deposited in water or another medium may exert a poisonous effect detrimental to people or to the propagation, cultivation, or conservation of animals, or other aquatic life.

Toxicology — The study of chemical agents that cause diminished health and death in organisms, including humans. The study involves the chemistry, recognition, identification, measurement, distribution, and metabolism of hazardous substances to which organisms are exposed. The science also includes the prediction of potential adverse effects of chemicals on organisms, including humans.

Toxic Salt Reduction — Decreasing harmful concentrations of toxic salts in soils, usually by leaching and with or without the addition of soil amendments.

Toxin — Any of a variety of unstable, poisonous compounds produced by some microorganisms and causing certain diseases or physical reactions.

Trace — The amount of rainfall or other form of precipitation which occurs when the quantity is so small that it cannot be measured in the rain gage.

Trace Elements — Elements essential to plant or animal life but required only in small amounts, such as the trace amounts of manganese, zinc, iron, molybdenum, cobalt, and copper.

Trace Metals — A general term for metals found in small quantities (less than 1 milligram per liter — mg/l) in water, usually due to their insolubility.

Tract — An expanse of land or water.

Tractive Force — The drag on a stream bank caused by passing water, which tends to pull soil particles along with the stream flow.

Tragedy of the Commons — The concept that no one takes responsibility for things that everybody owns.

Transbasin — Generally, the transfer of water from one river basin to another river basin.

Transfer — (1) Refers to the movement of water from one reservoir or storage facility to another. (2) A movement of water or water rights that involves a change in point of diversion, a change in type of use, or a change in location of use.

Transfer (Water Right) — (1) The process of transferring a water right from one person to another. (2) A passing or conveyance of title to a water right; a permanent assignment as opposed to a temporary lease or disposal of water. Most states require that some formal notice or filing be made with an appropriate state agency so that the transaction is officially recorded and the new owner is recorded as the owner of the water right.

Transfer Rate — The use-rate for a water right that is transferred from an owner to a buyer.

Transfer or Change in Use (Water Right) — Generally, this term refers to a change in the place of use or purpose of use of water authorized by a particular water right. If done in the proper manner, the change can be made without loss of priority.

Transient Flow — Unsteady flow during a change from a steady-flow state to another steady-flow state.

Transient Water System — A non-community water system that does not serve 25 of the same nonresidents per day for more than six months per year.

Transition Zone — The intervening area between distinct environments.

Transitional Storage Reserve — The quantity of water in storage in a particular groundwater aquifer that is extracted during the transition period between natural equilibrium conditions and new equilibrium conditions with groundwater pumped at perennial yield levels.

Translatory Wave — (Hydraulics) (1) A gravity wave that propagates in an open channel and results in appreciable displacement of the water in a direction parallel to the flow. (2) A wave, such as a flood wave, whose water particles constantly progress in the direction of the wave movement; a characteristic of unsteady flow. A gravity wave that propagates in an open channel and results in displacement of water particles in a direction parallel to the flow.

Transmissibility (Ground Water) — The capacity of a rock to transmit water under pressure. The coefficient of transmissibility is the rate of flow of water, at the prevailing water temperature, in gallons per day, through a vertical strip of the aquifer one foot wide, extending the full saturated height of the aquifer under a hydraulic gradient of 100 percent. A *Hydraulic Gradient* of 100 percent means a one foot drop in head in one foot of flow distance.

Transmission Lines — Pipelines that transport raw water from its source to a water treatment plant, then to the distribution grid system.

Transmissivity, also Coefficient of Transmissivity (ô) — The ability of an aquifer to transmit water. The rate at which water of the prevailing kinematic viscosity is transmitted through a unit width of the aquifer under a unit *Hydraulic Gradient*. It is equal to an integration of the hydraulic conductivities across the saturated part of the aquifer perpendicular to the flow paths. Also, the rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient. Transmissivity values are given in gallons per minute through a vertical section of an aquifer 1 foot wide and extending the full saturated height of an aquifer under a hydraulic gradient of one in the *English Engineering System*; in the *Standard International System*, transmissivity is given in cubic meters per day through a vertical section of an aquifer 1 meter wide and extending the full saturated height of an aquifer under hydraulic gradient of one. It is a function of properties of the liquid, the porous media, and the thickness of the porous media. Also see *Coefficient of Transmissivity*.

Transparency — The portion of light that passes through water without distortion or absorption. A measure of the *Turbidity* of water or other liquids.

Transpiration — (1) The movement of water from the soil or ground water reservoir via the stomata in plant cells to the atmosphere. (2) The quantity of water absorbed, transpired, and used directly in the building of plant tissue during a specified time period. It does not include soil evaporation. (3) The process by which water vapor escapes from a living plant, principally through the leaves, and enters the atmosphere. As considered practically, transpiration also includes *Guttation*. Transpiration, combined with *Evaporation* from the soil, is referred to as *Evapotranspiration*.

Transpiration Ratio — The number of pounds of water required for transpiration per pound of dry plant tissue produced.

Transport — Conveyance of solutes and particles in flow systems.

Transport Capacity — The ability of a stream to transport a *Suspended Load*, expressed in terms of the total weight of the suspended particles.

Trap — A device for sealing a passage against the escape of gases, especially a U-shaped or S-shaped bend in a drainpipe that prevents the return flow of sewer gas by means of a water barrier.

Trap Efficiency (of Reservoirs) — The ratio of sediment retained within the reservoir to the sediment inflow of the reservoir expressed as a percentage.

Trash Rack — (1) A barrier placed at the upstream end of a culvert to trap debris but allow water to flow through. (2) A screen located at an intake fixture of a dam spillway or other such conduit to prevent the ingress of debris.

Travertine — A form of calcium carbonate ($CaCO_3$), such as aragonite or calcite, that is precipitated out of hot mineral springs as it cools upon reaching the ground surface. Travertine becomes colored by minerals in the water and by biological action and is sometimes quarried for use as decorative stone. Also see *Tufa*.

Tray Tower — (Air Quality) An air pollution control device in which contaminated air is passed through a tower containing substances (packing) possessing large surface area. Water is passed over the packing material in a countercurrent fashion, i.e., in a direction opposite to the passage of the air, and the air contaminants are then absorbed into the liquid. Also referred to as *Absorption Tower*, *Packed Tower*, or *Spray Tower*.

Treated (Wastewater) Effluent — Water that has received primary, secondary, or advanced treatment to reduce its pollution or health hazards and is subsequently released from a wastewater facility after treatment.

Treatment — Any method, technique, or process designed to remove solids and/or pollutants from wastestreams and effluents. Also see *Pretreatment*, *Primary Wastewater Treatment*, *Secondary Wastewater Treatment*, and *Tertiary Wastewater Treatment*.

Treatment Facility — Any place(s) where a community water system or *Nontransient-Noncommunity Water System* alters the physical or chemical characteristics of the drinking water. Chlorination may be considered as a function of a *Distribution System*.

Treatment Plant — A structure built to treat wastewater before discharging it into the environment.

Treatment Tank — A water-tight tank designed to retain sewage long enough for satisfactory bacterial decomposition of the solids to take place. *Septic Tanks* and *Aerobic Sewage Treatment Tanks* are examples.

Tree — A woody plant which at maturity is usually 6 meters (20 feet) or more in height and generally has a single trunk, unbranched for 1 m or more above the ground, and a more or less definite crown; e.g., red maple (*Acer rubrum*), northern white cedar (*Thuja occidentalis*).

Tree Line — The dividing point, caused by changing latitudes or altitudes, between areas with environmental conditions supporting trees and those that do not. The tree line in North America defined by latitude runs across northern Canada. Tree lines also exist at lower latitudes because of the altitudes in such places as in the Rocky Mountains and the Sierra Nevada Mountains.

Trellis Pattern — A roughly rectilinear arrangement of stream courses in a pattern reminiscent of a garden trellis, developed in a region where rocks of differing resistance to erosion have been folded, beveled, and uplifted.

Tremie — A device used to place concrete or grout under water.

Trend — (1) A statistical term referring to the direction or rate of increase or decrease in magnitude of the individual members of a time series of data when random fluctuations of individual members are disregarded. (2) A unidirectional increasing or decreasing change in the average value of a variable.

Trespass — Any voluntary transgression of law or rule, as to enter wrongfully upon another's land or to infringe upon another's rights to use water.

Tributary — (1) A stream which joins another stream or body of water. (2) A stream or other body of water, surface or underground, which contributes its water, even though intermittently and in small quantities, to another and larger stream or body of water.

Trickle — To flow or fall in drops or in a thin stream.

Trickle Channel — A longitudinal channel constructed along the center and lowest part of a channel or through a detention or retention facility and intended to carry low flows. Also referred to as a *Cunette*.

Trickle (Drip) Soil Absorption System — A shallow slow rate pressure-dosed system used for land application of treated wastewater, particularly under soil conditions unsuitable for normal septic tanks and gravity-fed soil absorption systems. In agriculture, drip soil irrigation systems irrigate crops by means of a network of shallow underground pipes fed by a pump. Such a system conserves water used in crop irrigation by applying it at a controlled rate in the root zone, minimizing evaporation and percolation losses. In the drip soil absorption system, the filtered effluent is delivered via supply lines to a subsurface drip field consisting of parallel rows of polyethylene tubing, known as dripper lines. Emitters are installed along these tubes to uniformly distribute and control the flow

of effluent. The key to the effective operation of drip soil absorption systems is the slow and controlled rate at which it applies effluent over a large surface area, allowing relatively shallow placement of the dripper lines and long-term use without risk of saturating soils. This allows such systems to be effectively used for subsurface irrigation of trees, shrubs, and gardens in arid regions. Also see *Septic Tank Soil Absorption System (ST–SAS)*.

Trickle Tube — A small diameter pipe to take water by gravity from a farm pond to a drinking receptacle without allowing livestock access to the pond.

Trickling Filter — (Water Quality) A means of secondary sewage treatment used to remove soluble or colloidal organic compounds. The filter consists of a bed of small rocks or other suitable material provides a surface for the growth of microorganisms. As the clarified wastewater (from which the particulate material has been removed) passes through the trickling filter, organic material is metabolized by aerobic processes by the attached organisms. Also see *Secondary Wastewater Treatment*.

Trihalomethanes (THMs) — (1) Any of several synthetic organic compounds formed when chlorine combines with organic materials in water during the disinfection process. The most common THM is chloroform. (2) A group of low-molecular-weight, halogenated hydrocarbons, derivatives of methane, CH_4, in which three halogen atoms (chlorine, bromine, or iodine) are substituted for three of the hydrogen atoms. The subsequent substances typically include the compounds of chloroform ($CHCl_3$), dichlorobromomethane ($CHCl_2Br$), dibromochloromethane ($CHClBr_2$), and bromoform ($CHBr_3$). The sum of these four compounds is referred to as *Total Triholomethanes (TTHMs)*. The group includes suspect human *Carcinogens*. Small amounts of THMs have been detected in raw water collected from surface sources used as a public water supply, and concentrations have been shown to be increased during the chlorination phase of the water purification process. The most marked increase during chlorination of drinking water has been recorded in water containing suspended particles and/or humic substances.

Tri-Partite Agreement [Lahontan Valley, Nevada] — The 50-year agreement among Truckee-Carson Irrigation District (TCID), Nevada State Board of Fish and Game Commissioners (currently the Nevada Board of Wildlife Commissioners as part of the Nevada Division of Wildlife, NDOW), and U.S. Fish and Wildlife Service (USFWS) regarding the establishment, development, operation, and maintenance of *Stillwater National Wildlife Management Area*, dated November 26, 1948. In 1960 the management of this area was changed to a two-party agreement between USFWS and NDOW.

Triphibian — Designed to operate on land, water, or in air.

Triple Point — The condition of temperature and pressure under which the gaseous, liquid, and solid phases of a substance can exist in equilibrium. For water, at a standard pressure of one (1) atmosphere, this represents a temperature of 273.16 Kelvin (K), 0.01°C (Celsius), and 32.02°F Fahrenheit. Also see *Temperature Scale*, *Celsius [Temperature Scale]*, *Centigrade [Temperature Scale]*, and *Fahrenheit [Temperature Scale]*.

Trompe — An apparatus in which water falling through a perforated pipe entrains air into and down the pipe to produce an air blast for a furnace or forge.

(Mean) Trophic State Index (TSI) — A measure of *Eutrophication* of a body of water using a combination of measures of water transparency or turbidity (using *Secchi Disk* depth recordings), *Chlorophyll–a* concentrations, and total phosphorus levels. TSI measures range from a scale 20–80 (referred to as *Carlson's Trophic State Index*). 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).

Trophogenic Region — The area of a body of water where organic production from mineral substances takes place on the basis of light energy and photosynthetic activity.

Tropical Dry Forest — Similar to *Tropical Rain Forest* in as much as characterized by high temperatures throughout the year, but there is also a well-defined dry season that limits plant growth and animal activity. Also, unlike the tropical rain forest, many of the trees and plants in this type of *Bioclimatic Zone* are *Deciduous*. Also see *Biome*.

Tropical Rain Forest — A dense forest occupying a tropical region with high temperatures throughout the year and a maximum annual rainfall of in excess of 200 inches. Plants are typically *Evergreen*, retaining their leaves throughout the year. Tropical rain forests represent the richest natural terrestrial environment in terms of the amount of *Biomass* and the number of species present. These forests occupy the equatorial regions of South and Central America, Central Africa, and Southeast Asia. Such forests include up to five times the number of species of trees as found in temperate regions and an unrivaled number of species of associated plants and animals. Paradoxically, the soil of the typical rain forest is very thin and low in plant nutrients. The temperatures usually remain between 70°F and 95°F the year round, and the rainfall typically varies between 50 and 200 inches per year. The destruction and disturbance of tropical rain forests are of environmental concern because of the loss of many species (some yet to be described), the conversion of the land to a semidesert condition, disruption of the climatic

patterns of the region, and a worsening of the global balance in carbon dioxide production and utilization, among other factors. Also see *Biome*.

Tropopause — The boundary in the *Atmosphere* between the layer next to the surface of the earth (*Troposphere*) and the next highest layer (*Stratosphere*).

Troposphere — The lowest layer of the earth's *Atmosphere* and the site of all weather processes. It extends up to an altitude of about 7 miles (11 kilometers) above the polar zones and to about 10 miles (16 kilometers) above the equatorial regions and is characterized by decreasing temperature with increasing altitude. The *Tropopause* forms the boundary between troposphere and *Stratosphere*. The troposphere contains 80 percent of all the mass of the gases in the atmosphere and 99 percent of the water vapor.

Trough — (1) A long, narrow, generally shallow receptacle for holding water or feed for animals; any of various similar containers for domestic or industrial use. (2) A gutter under the eaves of a roof. (3) A long, narrow depression, as between waves or ridges. (4) A long but shallow depression in the bed of the sea. (5) (Meteorology) An elongated region of relatively low atmospheric pressure, often associated with a front.

Troy Weight — A system of units of weight in which the grain is the same as in the *Avoirdupois Weight* system and the pound contains 12 ounces, 240 penny weights, or 5,760 grains.

TRPA — See *Tahoe Regional Planning Agency (TRPA)*.

Truckee–Carson Irrigation District (TCID) [Nevada] — The agent of the U.S. Department of the Interior *Bureau of Reclamation (USBR)* which serves the interests of the water-righted agricultural water users in the *Newlands (Irrigation) Project*, located in Churchill County, Nevada. The Newlands Project, originally named the Truckee–Carson Irrigation Project, was America's first federal reclamation project completed under the Reclamation Act of 1902. The Truckee–Carson Irrigation District has operated the Newlands Project since 1926 and is responsible for dispersing some 320,000 acre-feet of water from the Carson and Truckee rivers during normal water years. TCID is responsible for the operation of the Lake Tahoe Dam at the outlet to Lake Tahoe at Tahoe City in Placer County, California, Derby Dam on the lower Truckee River in Washoe County, Nevada, Lahontan Dam on the lower Carson River in Churchill County, Nevada, and, some six miles below Lahontan Dam, the Carson Diversion Dam which distributes the releases from Lahontan Reservoir into the project's principal "T" (T–Line) and "V" (V–Line) primary distribution canals. Within the Newlands Projects, there are 102 miles of main canals, 312 miles of irrigation laterals, an extensive system of private ditches, 345 miles of drainage ditches, and numerous diversion dams and regulating reservoirs. TCID offices are located in Fallon, Nevada (Churchill County), and its operations are managed by a Project Manager, a board of seven members, and approximately 50 full-time employees. In 1978 the USBR canceled the contract under which TCID had operated the project since 1926. The cancellation was in response to a refusal of the farmer-dominated organization to follow federal water conservation guidelines, or *Operating Criteria and Procedures (OCAP)*. TCID has been operating under a temporary contract since 1984.

Truckee–Carson Irrigation Project [Nevada] — Original name of the *Newlands (Irrigation) Project [Nevada]*. Renamed in 1919 in honor of U.S. Senator from Nevada Francis G. Newlands and his sponsor ship of the 1902 Reclamation Act, which ultimately brought this project to Nevada. Also see *Truckee–Carson Irrigation District (TCID)*.

Truckee Division [Newlands Irrigation Project, Nevada] — The Truckee Division of the Newlands Project is located from Fernley (Lyon County) through Hazen and the Swingle Bench area, primarily in Churchill County, Nevada. It contains about 6,000 acres of water-righted land, and relies solely on water from the Truckee River, delivered through the Truckee Canal.

Truckee River Agreement [Nevada and California] — The Truckee River Agreement (1935) represents the current basis for the operation of the Truckee River, including its tributaries and diversions, between its source (Lake Tahoe) and its terminus (Pyramid Lake). Parties to this agreement include the *Truckee–Carson Irrigation District (TCID)*, serving the irrigation rights of agricultural water users of the *Newlands (Irrigation) Project [Nevada]* in Churchill County, Nevada, Sierra Pacific Power Company (SPPCo), serving primarily the municipal and industrial water needs of the cities of Reno and Sparks, Nevada, and the Washoe County Water Conservation District (WCWCD), serving the agricultural water users in the Truckee Meadows. Operation of upstream reservoirs is under the supervision of the Federal Water Master, who administers court-imposed requirements under the *Orr Ditch Decree [Nevada and California]* to supply water to achieve *Floriston Rates [California]* (mandated river flow rates) at the California–Nevada border. The 1944 Orr Ditch Decree, which incorporates the Truckee River Agreement, affirmed numerous individual water rights (both municipal and industrial and agricultural), including Truckee River diversion rights earlier than 1939. The Truckee River Agreement provides for operation of storage facilities, especially Lake Tahoe, to satisfy these rights and required the building of Boca Dam and Reservoir. The

agreement further contains language intended to settle the disputes over pumping Lake Tahoe by:

[1] Establishing the natural conditions in the bed and banks of Lake Tahoe and of the Truckee River near Tahoe City, Placer County, California, and prohibiting any alteration of such natural conditions without the approval of the Attorney General of the State of California, and, in fact, allowing parties to the agreement the right to restore these areas to their natural condition, as necessary;

[2] Prohibiting the creation of any other outlet of Lake Tahoe in addition to the present and natural outlet at the head of the Truckee River;

[3] Prohibiting the removal of water from Lake Tahoe for irrigation or power uses by any means other than gravity except upon the declaration of the U.S. Secretary of the Interior; and

[4] Prohibiting the removal of water from Lake Tahoe for sanitary or domestic uses by any means other than gravity, except upon the condition that the Departments of Health of the States of Nevada and California, or other officers exercising similar authority, shall first have made and filed with the Attorney General of the State of Nevada and the Attorney General of the State of California certificates showing that a necessity for such pumping of Lake Tahoe exists.

The prescribed Floriston rates constitute the chief operational objective on the Truckee River today and originated as a turn-of-the-century flow requirement for run-of-the-river users — hydropower and a pulp and paper mill. Stored water in Lake Tahoe and Boca Reservoir is used to "make rates," as specified in the Truckee River Agreement, when the river's natural flow alone does not suffice. The following is a listing of the dams and reservoirs that are operated along the Truckee River and their ownership, uses, and operational criteria. Not all these reservoirs are operated as part of the Truckee River Agreement.

[1] ***Lake Tahoe*** — The first dam at Lake Tahoe's exit into the Truckee River, located at Tahoe City in Placer County, California, was constructed in the early 1870s and the existing Lake Tahoe Dam was constructed in 1913. The Lake Tahoe drainage area covers approximately 506 square miles. Water is stored only in the top 6.1 feet, from an elevation of 6,223.0 feet (the lake's assumed natural rim above mean sea level — MSL) to an elevation of 6,229.1 feet (MSL). Total storage capacity equals approximately 744,600 acre-feet and is used to supplement Floriston rates in conjunction with natural runoff of other tributaries and Boca Dam releases. The Lake Tahoe Dam is owned by the USBR and operated under agreement by the TCID for the Newlands Project in Churchill County, Nevada. Lake Tahoe storage capacity is not considered part of the U.S. Army Corps of Engineers (COE) flood control system. Lake Tahoe waters may be exchanged for water from Prosser Creek Reservoir (the Tahoe–Prosser Exchange Agreement) in order to maintain a live stream below the Lake Tahoe Dam without adversely affecting Nevada water users' storage. Whenever possible, Lake Tahoe releases are to maintain a minimum instream flow of 50–70 cubic feet per second (cfs) downstream from the dam (varies with season).

[2] ***Donner Lake*** — The first dam on Donner Lake was built in 1877, while the current dam was constructed in the 1930s. Donner Lake drains an area of only approximately 14 square miles. Water in Donner Lake is privately owned by Sierra Pacific Power Company (SPPCo) of Reno, Nevada and TCID and is not required to be used to meet Floriston rates. The dam is jointly owned and operated by SPPCo and TCID. Lake storage levels range between 5,924 feet MSL and 5,935.8 feet MSL (providing for 9,500 acre-feet of storage capacity). The SPPCo portion of the stored water is used to supplement Reno–Sparks municipal and industrial water use; the TCID portion is used to supplement Newlands Project irrigation water requirements. After the lake fills, lake inflows are passed through to supplement Floriston rates. Lake storage is not part of COE flood control system. The State of California requires a minimum flow of 2–3 cfs downstream from the dam for maintaining fish habitat.

[3] ***Independence Lake*** — The original Independence Lake dam was constructed in 1879 and created a storage capacity of 3,000 acre-feet. After SPPCo acquired ownership of the lake and dam in 1937, the dam was enlarged in 1939 to its present size with a total storage capacity of 17,500 acre-feet. Independence Lake drains an area of only eight square miles. Like Donner Lake water, this water is privately owned and not required to be used to meet Floriston rates; the stored waters are owned by SPPCo and supplement the SPPCo water supply for the Reno–Sparks municipal and industrial water use during droughts. The lake's first storage priority is for 3,000 acre-feet of (original) storage; an additional 14,500 acre-feet of storage is permitted after Boca Reservoir is full and the Floriston rates and Truckee River diversion rights (Orr Ditch Decree) are satisfied. The State of California requires a minimum flow of 2 cfs downstream from the dam for maintaining fish habitat.

[4] ***Martis Creek Reservoir*** — The Martis Creek Dam was constructed by the COE in 1971 and was

intended to store waters from a 40 square mile drainage area to include not only Martis Creek, by the East, West, and Central Martis Creeks as well. In accordance with COE requirements, this reservoir, with a total storage capacity of 20,400 acre-feet, serves only flood control purposes. While legislation allows for other uses, only temporary storage is currently permitted due to an unsafe, leaking dam. Except during flood storage, reservoir outflows equal inflows.

[5] ***Prosser Creek Reservoir*** — The Prosser Creek Reservoir was constructed by the USBR in 1962 to store waters from a 50 square mile drainage area beginning 11 miles to the west at Warren Lake. The reservoir, with a total capacity of 29,800 acre-feet, is owned and operated by the USBR for three purposes: (a) as part of the COE Truckee River flood control program; (b) the storage of water under the terms of the Tahoe–Prosser Exchange Agreement (which provides that a portion of this water, when available, may be used to meet Floriston rates in lieu of making such releases from Lake Tahoe); and (c) to meet the spawning flow needs of Pyramid Lake's endangered cui-ui fish species and its threatened Lahontan cutthroat trout, or for other federal purposes. The State of California generally requires a minimum flow of natural flow or 5 cfs, whichever is less, downstream from the dam for maintaining fish habitat.

[6] ***Stampede Reservoir*** — The dam and reservoir, constructed by the USBR in 1970, drains an area of some 136 square miles and has a total capacity of 226,000 acre-feet. Water must be used primarily for spawning flows for the endangered cui-ui fish species and the threatened Lahontan cutthroat trout of Pyramid Lake. Storage space is also part of COE flood control plan. Stampede Reservoir water may be stored only after: (1) Floriston rates and Truckee River diversion rights have been satisfied; (2) Boca Reservoir is full; and (3) Independence Lake is full. Due to its relatively junior water rights, this reservoir seldom fills and therefore has been targeted as a prime storage location for Reno–Sparks municipal water as part of the Negotiated Settlement (Public Law 101–618) and the implementation of a new Truckee River Operating Agreement (TROA). The State of California requires a minimum flow of 30 cfs downstream from the dam for maintaining fish habitat (although this agreement has expired, the rates of flow have been maintained).

[7] ***Boca Reservoir*** — The original Boca dam was built around 1868 for ice harvesting. The present, much larger dam, was constructed in 1937 and created a reservoir with a total capacity of 40,800 acre-feet and a drainage area, to include the entire Little Truckee River Basin (including both Independence Lake and Stampede Reservoir) of some 172 square miles. Title to stored water is held by the USBR and operated by the Washoe County Water Conservation District (WCWCD). The reservoir's water is used in conjunction with Lake Tahoe water to maintain Floriston rates and to provide part of the required COE flood control capacity. Up to 25,000 acre-feet of water may be stored in Boca Reservoir only after Floriston rates are satisfied and Independence Lake's first storage priority of 3,000 acre-feet is satisfied. The balance may not be filled unless the Newlands Project diversion right at Derby Dam (on the lower Truckee River) has been satisfied. SPPCo stores a small portion (800 acre-feet) of its privately owned stored water (POSW) rights here. There are no minimum downstream flow requirement associated with Boca Reservoir.

[8] ***Derby Dam/Truckee Canal/Lahontan Reservoir*** — Although Lahontan Reservoir is not a storage facility of the Truckee River Basin, it does store Truckee River waters diverted at Derby Dam on the lower Truckee River. Derby Dam, which is located approximately 11 miles upstream from Wadsworth, Nevada, is the regulating device by which Truckee River waters are diverted into the Truckee Canal for use within the Truckee Division of the Newlands Project and for storage in Lahontan Reservoir in the Carson River Basin for use within the Carson Division of the Newlands Project. The dam, originally named the Truckee River Diversion Dam, was completed by the USBR in June 1905, whereas the Truckee Canal was not completed through to the Carson River until August 1906. Lahontan Reservoir was not completed until 1915, at which time the Truckee Canal's outlet was re-routed slightly upstream so as to enter Lahontan Reservoir instead of flowing directly into the Carson River below the dam. Diversions and releases are conducted in accordance with the Truckee River Agreement, the Orr Ditch Decree, and Newlands Project OCAPs, which allow for a maximum diversion of up to 1,500 cfs (Orr Ditch Decree right, although current canal capacity is only 900 cfs) from: (a) remainder of Floriston rates and return flows from upstream diversions; (b) right to Truckee River tributary water; and (c) any water bypassed or released to obtain space to store flood waters in reservoirs if water right holder did not identify a use for the release. Under the more recent project OCAPs, the quantity of water which may be diverted from the Truckee River at Derby Dam varies with the determination of irrigation

entitlement each year (water-righted acreage to be irrigated and the appropriate water duty for bench and bottom lands) and the predicted runoff from the Carson River and water in storage in Lahontan Reservoir.

Also see *Operational Criteria and Procedures (OCAP) [Nevada]*, *Public Law 101–618 [Nevada and California]*, and *Truckee River Operating Agreement (TROA) [Nevada and California]*.

Truckee River General Electric Decree [California] — Represented the resolution, through a 1915 federal court consent decree, of a lengthy series of conflicts, litigation, and negotiations between the *U.S. Bureau of Reclamation (USBR)* and the Truckee River General Electric Company (predecessor to the present-day Sierra Pacific Power Company), which, in 1902, through a complicated series of real estate transactions had obtained title to the Lake Tahoe Dam, surrounding lands, and the hydropower plants on the Truckee River. The USBR was in desperate need of Lake Tahoe water for its Newlands Project, then nearing completion near Fallon in Churchill County. This decree granted the USBR an easement to operate the Lake Tahoe Dam and to use surrounding property owned by the power company. On its part, the USBR was required to provide certain year-round flow rates (the *Floriston Rates*), measured at a stream gage near the state line, to support hydropower generation. These rates, in fact, dated back to a 1908 river flow agreement among the Truckee River General Electric Company, the Floriston Land and Power Company, and the Floriston Pulp and Paper Company and required that "...there shall be maintained a flow of water in the said Truckee River at Floriston [California] of not less than 500 cubic feet per second from the First day of March to the 30th day of September inclusive, in each year, and of not less than 400 cubic feet per second from the 1st day of October to the last day of February, inclusive, in each year." While this decree did dictate how the Lake Tahoe Dam would be operated, it did little to solve the concerns of residents of the lake and lessen California's concerns over the apportionment of Lake Tahoe waters.

Truckee River Operating Agreement (TROA) [California and Nevada] — The Truckee River Operating Agreement is incorporated in Section 205 of *Public Law 101–618* (the *Negotiated Settlement*) and requires that the U.S. Secretary of the Interior negotiate an operating agreement for the Truckee River with the States of Nevada and California, and other parties. The intent of the TROA is to supplant the current *Truckee River Agreement* and provide for the comprehensive management of the Truckee River waters in California and Nevada, as well as to provide important long-term drought protection for the Reno–Sparks (Nevada) Metropolitan Area. The primary purpose of the TROA is to improve management of Truckee River reservoirs located in California by expanding existing operations for the benefit of municipal and industrial water use, increase drought storage, aid in the recovery of endangered and threatened fish species, and, in general, improve fish and wildlife habitat within the Truckee River Basin. This would be accomplished by "networking" reservoir releases and storage (i.e., unify reservoir operations for a common objective and into a single schedule) in a manner that would not infringe on existing water storage, release, and use rights or flood control requirements. The TROA would also allow for the exchange, transfer, and release of waters from the upstream reservoirs to improve the likelihood of maintaining instream flows for fish and wildlife. The TROA is intended to provided a number of substantive benefits to users of Truckee River waters. These benefits may be listed in four fundamental areas:

[1] ***Reservoir Management*** — Improve river flow and river management by improving flexibility, coordinate reservoir storage and release, allow transfers and exchanges among various reservoirs to reduce spills, provide for recreational pools, etc., create a water credit system, promote more efficient use of existing water supplies, allow for the storage of "other waters", centralize Truckee River water management, improve water accounting (budgeting) and forecasting, eliminate releases solely for power generation, permit storage of water savings from conservation in the Reno–Sparks Metropolitan Area, and provide for greater water marketing among private water rights holders;

[2] ***Fish and Wildlife*** — Enhance spawning potential of the Pyramid Lake endangered cui-ui (Chasmistes cujus) and threatened Lahontan cutthroat trout (Oncorhynchus clarki henshawi) fish species through improved overall river operations, commitment of specified waters, increased water availability, and mitigation of significant adverse environmental impacts;

[3] ***Municipal and Industrial Use*** — Provide additional M&I drought relief storage for the Reno–Sparks Metropolitan Area through an M&I Water Credit System;

[4] ***Conservation*** — Promote water conservation in the Reno–Sparks Metropolitan Area through water metering and various conservation programs.

Truckee Storage Project [Nevada] — A U.S. Bureau of Reclamation (USBR) storage project to provide a supplemental source of irrigation water for 29,000 acres in the Truckee Meadows (Washoe County) surrounding the cities of Reno and Sparks, Nevada. Diversion and delivery of irrigation water are made by the ditch companies which form the Washoe County Water Conservation District (WCWCD).

Tsunami — A huge sea wave caused by a great disturbance under an ocean, as a strong earthquake or volcanic eruption. Also see *Tidal Wave*.

Tube Settler — A device using bundles of tubes to let solids in water settle to the bottom for removal by conventional sludge collection means; sometimes used in sedimentation basins and clarifiers to improve particle removal.

Tuberculation (Tubercules) — Development or formation of small mounds of corrosion products on the inside of iron pipe. The tubercules so formed roughen the inside of the pipe, increasing its resistance to water flow. See *Microbiological Tuberculation*.

Tufa — (Geology) The calcareous and siliceous rock deposits of springs, lakes, or ground water. Typically consist of calcium carbonate ($CaCO_3$) deposits created by precipitation from supersaturated waters entering a cold lake from thermal springs. Some forms of shoreline tufa were created by an algal process in which carbon dioxide was extracted by the algae to produce insoluble calcium carbonate; this was then precipitated as aragonite (as opposed to calcite). Several primary forms of tufa have been identified:

[1] ***Lithoid*** — deposited in superimposed layers, compact and stony;
[2] ***Thinolite*** — made up of elongated skeletal crystals;
[3] ***Dendritic*** — the most abundant variety, of branching structure;
[4] ***Cellular*** — found as coatings; and
[5] ***Coralline*** — occurring in heads and coatings.

Also see *Travertine*.

Tuffs — (Geology) A volcanic rock composed of ash particles.

Tundra — A type of *Ecosystem* or *Biome* dominated by lichens, mosses, grasses, and woody plants. Tundra may be found both at high latitudes (arctic tundra) and high altitudes (alpine tundra). Arctic tundra is underlain by permafrost and is usually saturated, also classifying it also as a *Wetlands*.

Turbellarian — The tiny eddies created in water by the cilia any of a class (*Turbellaria*) of mostly aquatic and free-living flatworms (as a planarian).

Turbid — (1) Having the lees or sediment disturbed; roiled; cloudy. (2) Not clear or translucent; clouded, muddy; dull; impure; polluted. Also see *Turbidity*.

Turbidimeter — A device used to measure the degree of turbidity, or the density of suspended solids in a sample.

Turbidity — (1) A measure of the reduced transparency of water due to suspended material which carries water quality implications. The term "turbid" is applied to waters containing suspended matter that interferes with the passage of light through the water or in which visual depth is restricted. The turbidity may be caused by a wide variety of suspended materials, such as clay, silt, finely divided organic and inorganic matter, soluble colored organic compounds, plankton and other microscopic organisms and similar substances. Turbidity in water has public health implications due to the possibilities of pathogenic bacteria encased in the particles and thus escaping disinfection processes. Turbidity interferes with water treatment (filtration), and affects aquatic life. Excessive amounts of turbidity also make water aesthetically objectionable. The degree of the turbidity of water is measured by a *Turbidimeter*. (2) The collective optical properties of a water sample that cause light to be scattered and absorbed rather than transmitted in straight lines; the higher the intensity of scattered light, the higher the turbidity. Turbidity is expressed in nephelometric turbidity units (NTU) or Formazin turbidity units (FTU) depending on the method and equipment used.

Turbidity Current — A current in which a limited volume of turbid or muddy water moves relative to surrounding water because of its greater density.

Turbine — A propeller or wheel device driven by the pressure of liquid or gas.

Turbulence — A state of fluid flow in which instantaneous velocities exhibit irregular and apparently random fluctuations.

Turbulent Flow — (1) (Physics) The motion of a fluid having local velocities and pressures that fluctuate randomly. (2) The mechanism by which a fluid such as water moves near a rough surface. Fluid not in contact with the irregular boundary outruns that which is slowed by friction or deflected by the uneven surface. Fluid particles move in a series of eddies or whirls. Most stream flow is turbulent, and turbulent flow is important in both erosion and transportation. Contrast with *Laminar Flow*.

Turning Basin — A widened area in a navigation channel or harbor area which is constructed to enable ships to maneuver in a safe and efficient manner.

Turnout — A structure that diverts water from an irrigation canal to a distribution system or farm delivery point. Turnouts are used at the head of *Laterals*.

Turnover, Fall — A physical phenomenon that may take place in a body of water during early autumn. The sequence of events leading to fall overturn include: (1) the cooling of surface waters; (2) a density change in surface waters

producing convection currents from top to bottom; (3) the circulation of the total water volume by wind action; and (4) eventual vertical temperature equality. The overturn results in a uniformity of the physical and chemical properties of the entire water body. Also referred to as *Fall Overturn*. Also see *Spring Overturn*.

Turnover, Spring — A physical phenomenon that may take place in a lake or similar body of water during the early spring, most frequently in lakes located in temperate zones where the winter temperatures are low enough to result in freezing of the lake surface. The sequence of events leading to spring overturn include: (1) the melting of ice cover; (2) the warming of surface waters; (3) density changes in surface waters producing convection currents from top to bottom; (4) circulation of the total water volume by wind action; and (5) vertical temperature equality. The overturn results in a uniformity of the physical and chemical properties of the entire water mass. Also referred to as *Spring Overturn*. Also see *Fall Overturn*.

Typhoid Fever — An acute, highly infectious disease caused by a bacillus (*Salmonella typhi*) transmitted chiefly by contaminated food or water and characterized by high fever, headache, coughing, intestinal hemorrhaging, and rose-colored spots on the skin. Also referred to as *Enteric Fever*.

Typhoon — A tropical *Cyclone* occurring in the region of the Philippines or China Sea.