



Watershed Pollutant Load Monitoring Network sampling parameter descriptions

Laboratory analysis

<p>Total suspended solids (TSS)</p>	<p>Total suspended solids (TSS) are solids in water that can be trapped by a filter. TSS can include a wide variety of material, such as inorganic sediments like silt, clay, and organic material like decaying plant and animal matter. High concentrations of suspended solids can cause many problems for stream health and aquatic life. The decrease in water clarity caused by TSS can affect the ability of fish to see and catch food. Suspended sediment can also clog fish gills, reduce growth rates, decrease resistance to disease, and prevent egg and larval development. When suspended solids settle to the bottom of a water body, they can smother the eggs of fish and aquatic insects, as well as suffocate newly hatched insect larvae. Settling sediments can fill in spaces between rocks reducing the amount of space where aquatic organisms can reside.</p>
<p>Total suspended volatile solids (TSVS)</p>	<p>Total suspended volatile solids (TSVS) is a measure of the amount of TSS that are lost on ignition (heating to 550 degree Celsius). This measure is often used to determine the proportion of TSS composed of organic matter.</p>
<p>Turbidity</p>	<p>Turbidity is the measurement of scattered light that results from the interaction between a beam of light and particulate material in a liquid sample. It is an expression of the optical properties of a sample that causes these light rays to be scattered and absorbed rather than transmitted in straight lines through the sample¹. Turbidity of water is often caused by the presence of suspended and dissolved matter such as clay, silt, finely divided organic matter, plankton, other microscopic organisms, organic acids, and dyes. Turbidity has been used as a key indicator for water quality to assess the health and quality of environmental water sources. Higher turbidity values are typically associated with poorer water quality.</p>
<p>Dissolved orthophosphate phosphorus (DOP)</p>	<p>Dissolved orthophosphate phosphorus (DOP) is a measure of the filterable (soluble, inorganic) fraction of phosphorus, the form directly taken up by plant cells.</p>
<p>Total phosphorus (TP)</p>	<p>Phosphorus exists in water in either a particulate phase or a dissolved phase. Particulate matter includes living and dead plankton, precipitates of phosphorus, phosphorus adsorbed to particulates, and amorphous phosphorus. The dissolved phase includes inorganic phosphorus and organic phosphorus. Total phosphorus (TP) is a measure of all the forms of phosphorus, dissolved or particulate, found in a sample. Phosphorus is a nutrient required by all organisms for the basic processes of life. Phosphorus is a natural element found in rocks, soils and organic material. Phosphorus clings tightly to soil particles and is used by plants, so its concentrations in clean waters are generally very low. In freshwater lakes and rivers, phosphorus is often found to be the growth-limiting nutrient, because it occurs in the least amount relative to the needs of plants. If excessive amounts of phosphorus are added to the water, algae and aquatic plants can be produced in large quantities. When these algae die, bacteria decompose them, and use up oxygen.²</p>

<p>Nitrate plus nitrite nitrogen (NO₃+NO₂-N)</p>	<p>Nitrate (NO₃) is highly soluble (dissolves easily) in water and is stable over a wide range of environmental conditions. It is easily transported in streams and groundwater. Nitrates feed plankton (microscopic plants and animals that live in water), aquatic plants, and algae, which are then eaten by fish. Nitrite (NO₂) is relatively short-lived in water because it is quickly converted to nitrate by bacteria. Nitrogen is required by all organisms for the basic processes of life to make proteins, to grow, and to reproduce. Nitrogen is very common and found in many forms in the environment. Inorganic forms include nitrate (NO₃), nitrite (NO₂), ammonia (NH₃), and nitrogen gas (N₂). Excessive concentrations of nitrate and/or nitrite can be harmful to humans and wildlife.²</p>
<p>Total Kjeldahl nitrogen (TKN)</p>	<p>The measure of the sum of organic nitrogen, ammonia and ammonium: used in the calculation of total nitrogen. Ammonia is an inorganic form of nitrogen and is the least stable form of nitrogen in water. Ammonia is easily transformed to nitrate in waters that contain oxygen and can be transformed to nitrogen gas in waters that are low in oxygen. Ammonia is found in water in two forms - the ammonium ion (NH₄⁺), and dissolved, unionized (no electrical charge) ammonia gas (NH₃). (NH₃) is much more toxic to aquatic organisms than the ammonium ion (NH₄⁺). When plants and animals die, organic nitrogen contained within is broken down by bacteria to form ammonia (NH₃).</p>
<p>Total nitrogen</p>	<p>The sum of nitrate plus nitrite nitrogen and total nitrogen. Total nitrogen is the measure of all organic and inorganic forms of nitrogen contained within a water quality sample.</p>

In-field measurements

<p>pH</p>	<p>pH is a measure of acidity and alkalinity of a solution on a scale of 0 to 14, where 7 is neutral and lower numbers represent acidity and higher numbers represent alkalinity; the optimal range for most organisms is 6.5 to 8.2. Dissolved oxygen (DO) is indirectly affected by changes in pH. The toxicity of many compounds can be altered if pH changes, because pH alters chemical and biological reactions and processes. Changes in pH are predominantly related to the health of aquatic organisms, especially fish and invertebrates.</p>
<p>Temperature</p>	<p>Temperature is a measure of warmth or coldness of a substance with reference to a standard value (USGS). Temperature affects many physical, biological, and chemical characteristics such as dissolved oxygen, rate of photosynthesis, metabolic rates and sensitivity to toxics, parasites and disease.</p>
<p>Specific conductance</p>	<p>Specific conductance is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge). Conductivity is affected by temperature: the warmer the water, the higher the conductivity. For this reason, conductivity is reported as conductivity at 25 degrees Celsius. Conductivity is useful as a general measure of stream water quality. Each stream tends to have a relatively constant range of conductivity that, once established, can be used as a baseline for comparison with regular conductivity measurements. Significant changes in conductivity could then be an indicator that a discharge or some other source of pollution has entered a stream (USEPA).</p>

Dissolved oxygen (DO)	Dissolved oxygen is a measure of the amount of gaseous oxygen (O ₂) dissolved in water. Oxygen gets into water by diffusion from the surrounding air, aeration (rapid movement of water), and as a waste product of photosynthesis. Adequate DO is necessary for good water quality and oxygen is a necessary element to all forms of life. As DO levels in water drop below 5.0 mg/l, aquatic life is put under stress. The lower the concentration, the greater the stress. Oxygen levels that remain below 1-2 mg/L for a few hours can result in large fish kills.
Transparency	Designed to function like the traditional Secchi disk used in lake monitoring, a Secchi tube reading is an indirect measure of the amount of dissolved and suspended material present in the water.

References

1. S. Clesceri, L. Greenberg, A and Eater 1998. "Method 2130. Turbidity", Standard Methods for the Examination of Water and Wastewater, 20th Ed., American Public Health Association, Washington D.C.
2. Murphy, Shelia, 2007. [Boulder Area Sustainability Information Network](#).