# Appendix A: Glossary of Terms

**Acidic:** a condition where the concentration of positively-charged hydrogen ions is high, and the pH is less than 7.0.

**Aeration:** the process of mixing air into a solution so as to allow atmospheric gases to dissolve into the solution through direct contact, stirring, forced injection, or other means.

**Aerobic:** a condition existing or process conducted in the presence of oxygen.

**Alkalinity:** a measure of the ability of a solution to absorb positively-charged hydrogen ions without a significant change in pH. Also referred to as buffering capacity. Alkaline solutions have a pH greater than 7.0.

**Aluminum:** a common metal element found in CMD that oxidizes as a whitish powder at high pH levels.

**Anaerobic:** a condition existing or process conducted in the absence of oxygen.

**Anoxic:** a condition existing or process conducted in the absence of oxygen; anaerobic.

**Anoxic limestone drains (ALDs):** sealed pipes or ditches containing crushed limestone used to neutralize the acid in CMD.

**Appalachian Clean Streams Initiative:** a program sponsored by OSM to coordinate and focus CMD clean-up projects in the United States.

**Basic:** a condition where the concentration of negatively-charged hydroxide ions is high, and the pH is greater than 7.0; alkaline.

**Contaminated coal mine drainage:** mine runoff or discharge water containing abnormal acid or alkalinity levels, elevated sulfate and metal concentrations, and silt or other suspended solids.

**Dissolved oxygen:** the amount of oxygen ($O_2$) that is dissolved in a solution. Dissolved oxygen (D.O.) can cause armoring on limestone by oxidizing iron compounds in CMD to form iron hydroxide. D.O. is usually measured in parts per million (milligrams per liter).

**Dissolved solids:** compounds in a solution that can be precipitated through chemical processes into solids.

**Effluent:** the solution that flows out of a basin, pond, tank, wetland, ditch, pipe or other containment.

**Environmental Protection Agency:** the federal agency created by executive order in 1970 to coordinate efforts to protect human health and biological communities from environmental pollutants.

**Ferric hydroxide:** an iron compound that forms when dissolved iron in CMD is oxidized, and appears as a rusty, reddish-orange residue. It is often called yellow-boy.

**Flow rate:** the rate a solution moves through a ditch, wetland or pond, defined in terms of the quantity of CMD per unit of time (i.e., 500 gallons per hour, etc.).

**Hydrolysis:** a reaction that occurs when a salt dissolves in water and leads to changes in the $H_3O^+$ and $OH^-$ concentrations of the water.

**Hydroxide:** a compound containing the $OH^-$ molecule.

**Iron:** a common metal element contained in mine rocks in the form of iron sulfide that oxidizes as a reddish, rusty colored hydroxide solid.

**Leach:** migration of atoms or compounds from mine rocks or other substances through the action of water, acid or other solvent.

**Manganese:** a metal element found in CMD that oxidizes as a blackish stain.

**Metal:** elements that are solids (except mercury), have few electrons in the outermost shell, and lose electrons easily to form cations. Metals of concern in CMD include iron, aluminum, manganese and sometimes lead, mercury, copper, and zinc.

**Neutral:** a condition where the concentration of hydrogen ions [$H^+$] equals the concentration of hydroxide ions [$OH^-$], resulting in a solution that is neither acidic or basic (alkaline) and has a pH value of 7.0 standard units. Distilled water is a neutral liquid.

**Neutralize:** to cause a solution to move toward a pH reading of 7.0 standard units through chemical or biological processes.

**Office of Surface Mining:** the federal agency charged with enforcing SMCRA and dealing with health, safety and resource protection issues related to active mining and abandoned mine problems.

**Overburden:** the layers of rock and soil found above coal bed deposits. Overburden rocks often contain acid-forming materials in the form of iron sulfide and other compounds that can form dissolved metals and sulfates in CMD.

**Oxic:** a condition where atmospheric, gaseous oxygen is present.

**Oxidation:** a reaction in which a substance losses electrons. In the case of CMD metals oxidation, the oxidizing agent is gaseous oxygen. Metal oxides are formed in the process.

**Permeability:** a measure of the rate of water movement through soil or other substance.

**pH:** a value, expressed in standard units on a scale of 0-14, that uses a logarithmic measure to express concentrations of hydrogen ions [$H^+$]. pH readings below 7.0 are said to be acidic, and readings above 7.0 are basic, or alkaline. Each unit difference represents a ten-fold increase or decrease in acidity or alkalinity.

**Precipitate:** an insoluble, solid product that is formed when ions combine with atoms or molecules in the air or with other atoms or compounds in a solution. Also, the process of dissolved compounds becoming solidified.

**Porosity:** the ratio of the volume of voids (openings) to the total volume of material. Used to describe the ability of a fluid to move through crushed rocks or other material.

**Pyrite:** the iron-sulfide mineral, often called "fools gold," that is found in earthen and rock layers near coal seams. Pyrite is the usual source of the sulfur that binds with hydrogen and oxygen in rain water to form the sulfuric acid component of CMD.

**Reduction:** a reaction in which a substance gains electrons. In CMD treatment, reduction usually involves the stripping away of oxygen atoms from sulfate or metal compounds.

**Residence time:** the length of time that CMD remains in a treatment pond, wetland, ditch or other structure. Designed residence times depend on the incoming flow rate, the rate of treatment processes in the structure, the contaminants in the CMD to be treated, the size of the structure, and the settling rate of solids in the discharge.

**Sedimentation:** the process whereby particles (suspended solids) settle out of solution. Sedimentation produces a sludge or other layer of solids at the bottom of a sedimentation, or settling, pond.

**Settling Basin:** a large tank or pond designed to hold water or CMD for a long enough time to allow most of the suspended solids to settle out (sedimentation).

**Sludge:** the layer of solids that settle from a solution, including suspended silt and soil particles and precipitates formed by chemical processes.

**Solubility:** the amount of material that can dissolve in a given amount of water or other solvent at a given temperature to produce a stable solution. Highly soluble substances dissolve quickly. Soluble products will not settle out of a solution unless they are precipitated.

**Subsidence:** the settling of waste piles or other areas at mine sites which causes the surface of the land to sink.

**Substrate:** the rich, organic layer of compost or other material found at the bottom of wetlands.

**Subwatershed:** the watershed of a tributary in a larger watershed.

**Successive alkalinity producing systems (SAPs)** - specialized CMD treatment ponds that make use of chemical and biological processes to treat the acid, metals and sulfates in CMD.

**Sulfates:** compounds containing sulfur and oxygen as $SO_4$. Elevated sulfate levels are common in contaminated mine drainage. Sulfates can bond with hydrogen ions to form sulfuric acid, or bind to calcium atoms to form a gypsum solid.

**Surface Mining Control Act of 1977 (SMCRA):** The federal law that requires mining operations to prevent water pollution, reclaim mine lands and protect other resources.

**Suspended solids:** solid particles that are suspended in solution. Suspended solids in CMD can include oxidized metals, silt or soil and other tiny debris particles.

**Topographical map:** a map that shows land elevations by use of lines that connect points of equal elevation (contour lines), water bodies, streams, buildings, mine sites, roads and other land features.

**Watershed:** an area of land from which water drains toward a single channel.