GLOSSARY OF LAKE TERMINOLOGY

Algae: One-celled (phytoplankton) or multicellular plants either suspended in water (plankton) or attached to rocks and other substrates (periphyton). Their abundance, as measured by the amount of chlorophyll *a* (green pigment) in an open water sample, is commonly used to classify the trophic status of a lake. Numerous species occur. Algae are an essential part of the lake ecosystem and provides the food base for most lake organisms, including fish. Phytoplankton populations vary widely from day to day, as life cycles are short.

Alkalinity: A measure of the amount of carbonates, bicarbonates, and hydroxide present in water. Low alkalinity is the main indicator of susceptibility to acid rain. Increasing alkalinity is often related to increased algae productivity. Expressed as milligrams per liter (mg/l) of calcium carbonate (CaCO3).

Ammonia: A form of nitrogen found in organic materials and many fertilizers. It is the first form of nitrogen released when organic matter decays. It can be used by most aquatic plants and is therefore an important nutrient. It converts rapidly to nitrate (NO3–) if oxygen is present. The conversion rate is related to water temperature. Ammonia is toxic to fish at relatively low concentrations in pH-neutral or alkaline water.

Anion: Refers to the chemical ions present that carry a negative charge in contrast to cations, which carry a positive charge. There must be equal amounts of positive and negative charged ions in any water sample. Following are the common anions in their order of decreasing concentration for most lakes: bicarbonate (HCO3–), sulfate (SO4=), chloride (Cl–), carbonate (CO3=), nitrate (NO3–), nitrite (NO2–), and phosphates (H2PO4–, HPO4=, and PO4=).

Aquatic invertebrates: Aquatic animals without an internal skeletal structure such as insects, mollusks, and crayfish.

Bioaccumulation: see "Food chain."

Biomass: The total quantity of plants and animals in a lake. Measured as organisms or dry matter per cubic meter, biomass indicates the degree of a lake system's eutrophication or productivity.

Blue-green algae: Algae that are often associated with problem blooms in lakes. Some produce chemicals toxic to other organisms, including humans. They often form floating scum as they die. Many can fix nitrogen (N2) from the air to provide their own nutrient.

Calcium (Ca++): Its abundance is related to the presence of calcium-bearing minerals in the lake watershed. Reported as milligrams per liter (mg/l) as calcium carbonate (CaCO3), or milligrams per liter as calcium ion (Ca++).

Cation: Refers to chemical ions present that carry a positive charge. The common cations present in lakes in normal order of decreasing concentrations follow: calcium (Ca++), magnesium (Mg++), potassium (K+), sodium (Na+), ammonium (NH4+), ferric iron (Fe+++) or ferrous iron (Fe++), manganese (Mn++), and hydrogen (H+).

Chloride (Cl-): Chlorine in the chloride ion (Cl–) form has very different properties from chlorine gas (Cl2), which is used for disinfecting. The chloride ion (Cl–) in lake water is commonly considered an indicator of human activity. Agricultural chemicals, human and animal wastes, and road salt are the major sources of chloride in lake water.

Chlorophyll *a*: Green pigment present in all plant life and necessary for photosynthesis. The amount present in lake water depends on the amount of algae and is therefore used as a common indicator of water quality.

Clarity: see "Secchi disc."

Color: Measured in color units that relate to a standard. A yellow-brown natural color is associated with lakes or rivers receiving wetland drainage. The color of lakes ranges from zero to 320 units. Color also affects light penetration and therefore the depth at which plants can grow.

Concentration units express the amount of a chemical dissolved in water. The most common ways chemical data is expressed is in milligrams per liter (mg/l) and micrograms per liter (µg/l). One milligram per liter is equal to one part per million (ppm). To convert micrograms per liter (µg/l) to milligrams per liter (mg/l), divide by 1000 (e.g. 30 µg/l = 0.03 mg/l). To convert milligrams per liter (mg/l) to micrograms per liter (µg/l), multiply by 1000 (e.g. 0.5 mg/l = 500µg/l).

Conductivity (specific conductance): Measures water's ability to conduct an electric current. Conductivity is reported in micromhos per centimeter (µmhos/cm) and is directly related to the total dissolved inorganic chemicals in the water. Values are commonly two times the water hardness unless the water is receiving high concentrations of contaminants introduced by humans.

Drainage basin: The total land area that drains toward the lake.

Drainage lakes: Lakes fed primarily by streams and with outlets into streams or rivers. They are more subject to surface runoff problems but generally have shorter residence times than seepage lakes. Watershed protection is usually needed to manage lake water quality.

Dystrophic lake: A typically brownish-colored lake high in dissolved organic substances associated with bog vegetation. Does not follow eutrophication's normal pattern because of natural acidity or other chemical imbalances.

Epilimnion: see "Stratification."

Eutrophication: The process by which lakes are enriched with nutrients, increasing the production of rooted aquatic plants and algae. The extent to which this process has occurred is reflected in a lake's trophic classification: oligotrophic (nutrient poor), mesotrophic (moderately productive), and eutrophic (very productive and fertile).

Filamentous algae: Algae that forms filaments or mats attached to sediment, weeds, piers, etc.

Flushing rate: see "Retention time."

Food chain: The sequence of algae being eaten by small aquatic animals (zooplankton) which in turn are eaten by small fish which are then eaten by larger fish and eventually by people or predators. Certain chemicals, such as PCBs, mercury, and some pesticides, can be concentrated from very low levels in the water to toxic levels in animals through this process.

Groundwater drainage lake: Often referred to as spring-fed lake; has large amounts of groundwater as its source, and a surface outlet. Areas of high groundwater inflow may be visible as springs or sand boils. Groundwater drainage lakes often have intermediate retention times with water quality dependent on groundwater quality.

Hardness: The quantity of multivalent cations (cations with more than one +), primarily calcium (Ca++) and magnesium (Mg++) in the water expressed as milligrams per liter of CaCO3. Amount of hardness relates to the presence of soluble minerals, especially limestone, in the lake watershed.

Hypolimnion: see "Stratification."

Impoundment: Manmade lake or reservoir usually characterized by stream inflow and always by a stream outlet. Because of nutrient and soil loss from upstream land use practices, impoundments ordinarily have higher nutrient concentrations and faster sedimentation rates than natural lakes. Their retention times are relatively short.

Ion: A charged atom or group of atoms that has separated from an ion of the opposite charge. In water, some chemical molecules separate into cations (positive charge) and anions (negative charge). Thus the number of cations equals the number of anions.

Insoluble: incapable of dissolving in water.

Kjeldahl nitrogen: The most common analysis run to determine the amount of organic nitrogen in water. The test includes ammonium and organic nitrogen.

Limiting factor: The nutrient or condition in shortest supply relative to plant growth requirements. Plants will grow until stopped by this limitation for example, phosphorus in summer, temperature or light in fall or winter.

Macrophytes: see "Rooted aquatic plants."

Marl: White to gray accumulation on lake bottoms caused by precipitation of calcium carbonate (CaCO3) in hard water lakes. Marl may contain many snail and clam shells, which are also calcium carbonate. While it gradually fills in lakes, marl also precipitates phosphorus, resulting in low algae populations and good water clarity. In the past, marl was recovered and used to lime agricultural fields.

Metalimnion: see "Stratification."

Nitrate (NO3-): An inorganic form of nitrogen important for plant growth. Nitrogen is in this stable form when oxygen is present. Nitrate often contaminates groundwater when water originates from manure pits, fertilized fields, lawns or septic systems. High levels of nitrate-nitrogen (over 10 mg/l) are dangerous to infants and expectant mothers. A concentration of nitrate-nitrogen (NO3–N) plus ammonium-nitrogen (NH4–N) of 0.3 mg/l in spring will support summer algae blooms if enough phosphorus is present.

Nitrite (NO2-): A form of nitrogen that rapidly converts to nitrate (NO3–) and is usually included in the NO3– analysis.

Overturn: Fall cooling and spring warming of surface water increases density, and gradually makes temperature and density uniform from top to bottom. This allows wind and wave action to mix the entire lake. Mixing allows bottom waters to contact the atmosphere, raising the water's oxygen content. However, warming may occur too rapidly in the spring for mixing to be effective, especially in small sheltered kettle lakes.

Phosphorus: Key nutrient influencing plant growth in more than 80% of lakes. Soluble reactive phosphorus is the amount of phosphorus in solution that is available to plants. Total phosphorus includes the amount of phosphorus in solution (reactive) and in particulate form.

Photosynthesis: Process by which green plants convert carbon dioxide (CO2) dissolved in water to sugar and oxygen using sunlight for energy. Photosynthesis is essential in producing a lake's food base, and is an important source of oxygen for many lakes.

Phytoplankton: see "Algae."

Precipitate: A solid material which forms and settles out of water as a result of certain negative ions (anions) combining with positive ions (cations).

Retention time (turnover rate or flushing rate): The average length of time water resides in a lake, ranging from several days in small impoundments to many years in large seepage lakes. Retention time is important in determining the impact of nutrient inputs. Long retention times result in recycling and greater nutrient retention in most lakes. Calculate retention time by dividing the volume of water passing through the lake per year by the lake volume.

Respiration: The process by which aquatic organisms convert organic material to energy. It is the reverse reaction of photosynthesis. Respiration consumes oxygen (O2) and releases carbon dioxide (CO2). It also takes place as organic matter decays.

Rooted aquatic plants (macrophytes): Refers to higher (multi-celled) plants growing in or near water. Macrophytes are beneficial to lakes because they produce oxygen and provide substrate for fish habitat and aquatic insects. Overabundance of such plants, especially problem species, is related to shallow water depth and high nutrient levels.

Secchi disc: An 8-inch diameter plate with alternating quadrants painted black and white that is used to measure water clarity (light penetration). The disc is lowered into water until it disappears from view. It is then raised until just visible. An average of the two depths, taken from the shaded side of the boat, is recorded as the Secchi disc reading. For best results, the readings should be taken on sunny, calm days .

Sedimentation: Accumulated organic and inorganic matter on the lake bottom. Sediment includes decaying algae and weeds, marl, and soil and organic matter eroded from the lake's watershed.

Seepage lakes: Lakes without a significant inlet or outlet, fed by rainfall and groundwater. Seepage lakes lose water through evaporation and groundwater moving on a down gradient. Lakes with little groundwater inflow tend to be naturally acidic and most susceptible to the effects of acid rain. Seepage lakes often have long residence times. and lake levels fluctuate with local groundwater levels. Water quality is affected by groundwater quality and the use of land on the shoreline.

Soluble: capable of being dissolved.

Stratification: The layering of water due to differences in density. Water's greatest density occurs at 39°F (4°C). As water warms during the summer, it remains near the surface while colder water remains near the bottom. Wind mixing determines the thickness of the warm surface water layer (epilimnion), which usually extends to a depth of about 20 feet. The narrow transition zone between the epilimnion and cold bottom water (hypolimnion) is called the metalimnion or thermocline.

Sulfate (SO4=)**:** The most common form of sulfur in natural waters. The amounts relate primarily to soil minerals in the watershed. Sulfate (SO4) can be reduced to sulfide (S=) and hydrogen sulfide (H2S) under low or zero oxygen conditions. Hydrogen sulfide smells like rotten eggs and harms fish. Sulfate (SO4=) input from acid rain is a major indicator of sulfur dioxide (SO2) air pollution. Sulfate concentration is used as a chemical fingerprint to distinguish acid lakes acidified by acid rain from those acidified by organic acids from bogs.

Suspended solids: A measure of the particulate matter in a water sample, expressed in milligrams per liter. When measured on inflowing streams, it can be used to estimate the sedimentation rate of lakes or impoundments.

Thermocline: see "Stratification."

Trophic state: see "Eutrophication."

Turnover: see "Overturn."

Watershed: see "Drainage basin."

Zooplankton: Microscopic or barely visible animals that eat algae. These suspended plankton are an important component of the lake food chain and ecosystem. For many fish, they are the primary source of food.

Source: University of Wisconsin - http://www3.uwsp.edu/cnr-ap/weal/Documents/G3582.pdf