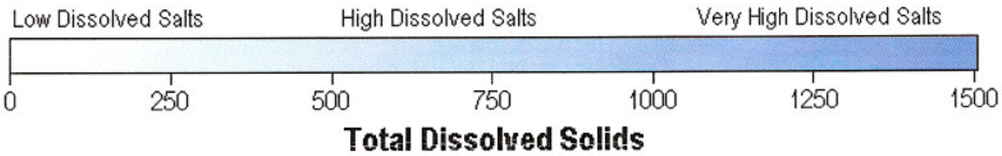
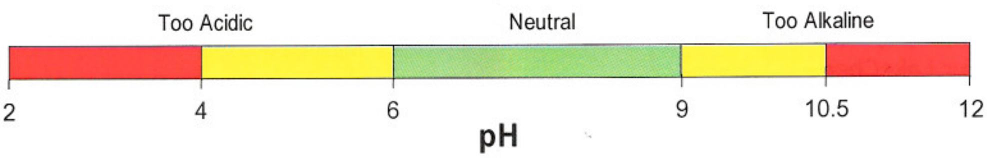
LAKE CHECK WATER QUALITY MEASUREMENTS

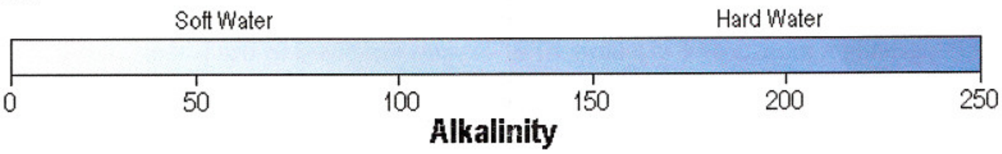
Conductivity and **Total Dissolved Solids (TDS)** measure the total amount of material dissolved in the water. Higher values indicate potentially richer, more productive water, whereas lower values indicate potentially cleaner, less productive water. Localized increases in conductivity and TDS may indicate inputs of groundwater or other nutrient-enriched water. [Note: Human activities that result in nutrient pollution (e.g., fertilizer runoff) can increase the productivity of algae and other organisms without raising conductivity/total dissolved solids very much. If nutrient pollution is occurring, the total phosphorus concentration is a much better indicator of potential productivity.]



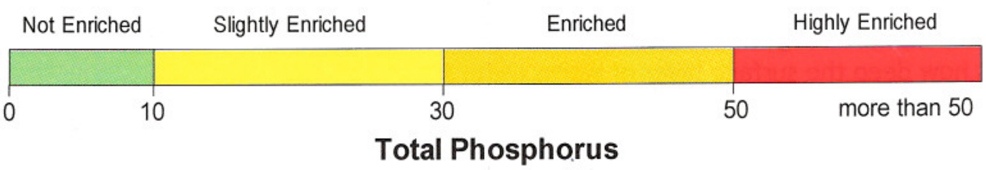
pH describes the balance between acids and bases in the water. Neutral values of pH (between 6 and 9) are desirable. Low pH values typically result either from the growth of bog vegetation (such as peat moss), acid precipitation ("acid rain"), or acid runoff (as in acid mine drainage). Excessive growth of certain plants and algae can raise pH values above 9.0 or 10.0.



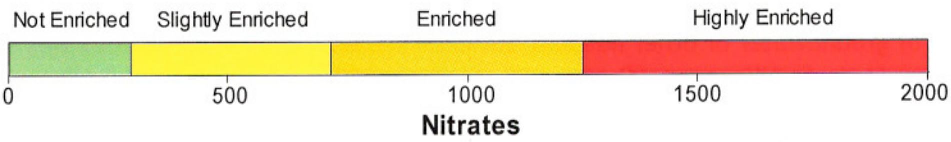
Alkalinity measures the concentration of carbonates and bicarbonates in the water. These compounds and other ions associated with them make water "hard". High alkalinity lakes are hardwater lakes, while low alkalinity lakes are softwater lakes. Different kinds of plants, algae, and other aquatic organisms live in hardwater than in softwater. Alkalinity also influences the effectiveness of some herbicides and algicides. Alkalinity is a basic characteristic of water, but is neither inherently good nor bad.



Total Phosphorus measures the total (organic and inorganic, dissolved and particulate) amount of phosphorus in the water. Phosphorus is usually the plant nutrient (i.e., fertilizer) that controls the amount of algal growth in lakes and ponds. Most Midwestern lakes have more phosphorus and more algae than is desirable, so lower values are generally better, though very unproductive water bodies typically support little fish production.

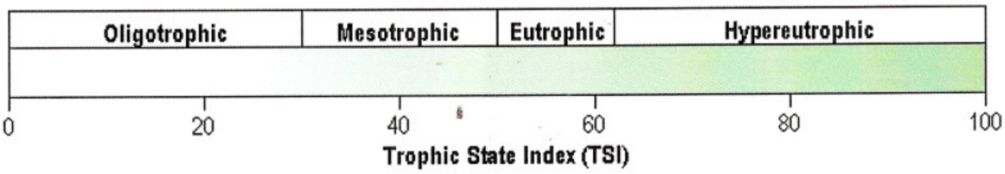


Nitrate measures the total inorganic amount of nitrogen in the water. Nitrogen is the plant nutrient (i.e., fertilizer) most likely to control the amount of rooted plant growth in lakes and ponds. Most Midwestern lakes have more nitrogen and more rooted plant growth than is desirable, so lower values are generally considered better.



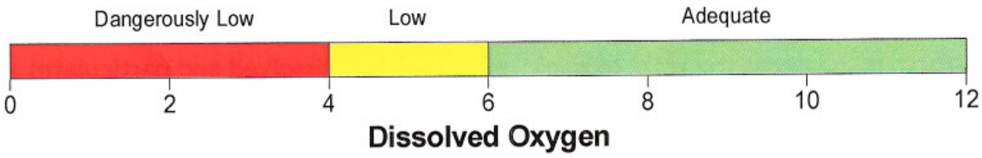
Trophic State Indices

Trophic State Indices calculate the trophic status of the waterbody. Waterbodies are classified as oligotrophic, mesotrophic, eutrophic or hypereutrophic depending on the overall amount of plants, algae and other organisms the waterbody supports. Lakes of different trophic states vary in a number of chemical characteristics and support different types of organisms (see the enclosure "Lake Trophic States and Eutrophication"). Thus the trophic state of a waterbody provides a wealth of information concerning the types of organisms living in the waterbody, the processes likely to occur there and the kinds of problems to be expected. Trophic State Index values can be calculated from a number of variables. LakeScan calculates Carlson's Trophic State Index (TSI) from total phosphorus, Secchi disk depth and chlorophyll (separate TSI values are calculated for each of the variables that was measured as part of your LakeCheck package).



LakeCheck Measurements Included Only In Full-Service Packages

Dissolved Oxygen is a measure of the amount of oxygen dissolved in the water. Oxygen is needed by fish and other aquatic organisms to allow them to "breath" underwater. Plants and algae produce oxygen by photosynthesizing during the day and use oxygen for respiration at night.



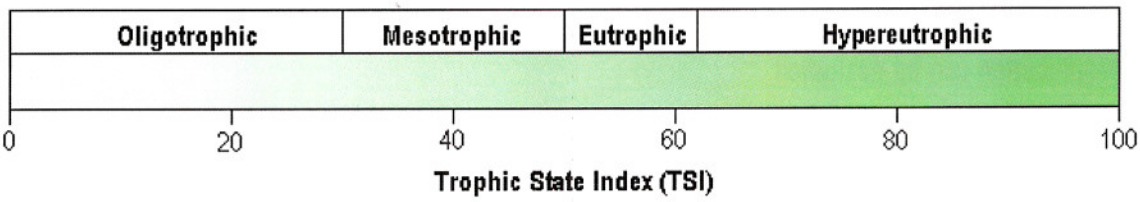
Temperature provides information about the kinds of fish that can grow in a lake, information necessary for interpretation of other parameters, and information about the extent to which a lake is stratified into layers having water of different temperatures. If the lake is stratified, the **thermocline depth** tells how deep the surface layer of warm water is.

WQ PRO
8865 100th Street SE
Alto, MI 49302
Phone 800-382-4434

Lake Trophic States and Eutrophication

Lakes are often categorized according to their Trophic Status. Trophic Status is a measure of nutrient richness and productivity (i.e., the ability to grow plants and animals). Lakes in different trophic categories also differ in a variety of other characteristics important to lake users and lake managers. Commonly used Trophic Status categories include: Oligotrophic, Mesotrophic, Eutrophic and Hypereutrophic. These may be further subdivided into intermediate categories, such as meso-oligotrophic, to describe lakes that have characteristics in between those of the major categories.

Trophic State Index (TSI) values are used to describe the trophic status of individual lakes. Indices typically rank lakes from 1 to 100, based on such parameters as Secchi disk depth, total phosphorus concentrations, and chlorophyll levels.



Characteristics Typical of Different Trophic States

	Oligotrophic	Mesotrophic	Eutrophic	Hypereutrophic
Water Clarity	excellent	Good	fair-poor	very poor
Nutrients	low	Moderate	high	very high
Algae	few	Moderate	blooms likely	severe blooms probable
Plants	few	Moderate	abundant	few, in shallows
Fishery	cold water possible	cold water possible	warm water only	rough fish often dominate

Oligotrophic Lakes have low nutrient levels, clear water and low productivity. High dissolved oxygen levels in cooler bottom waters allow the survival of cold water fish.

Mesotrophic Lakes have moderate nutrient levels, clear water and moderate productivity. Rooted plants may be abundant. Moderate dissolved oxygen levels in cooler bottom waters allow the survival of cold water fish.

Eutrophic Lakes have high nutrient levels, turbid water and high productivity. Algal blooms are likely and may sometimes be severe. Rooted plants may be very abundant. Dissolved oxygen is depleted from bottom waters, restricting fish populations to warm water species.

Hypereutrophic Lakes have very high nutrient levels, extremely turbid water, and very high algal productivity. Severe blooms of noxious blue-green algae are likely. High turbidity and luxuriant growth of filamentous algae restrict rooted plant growth. Turbidity tolerant plant species (e.g., sago pondweed,

8865 100th Street SE
Alto, MI 49302
Phone 800-382-4434

Eurasian watermilfoil, curly leaf pondweed) may persist in shallow areas. Periods of dissolved oxygen depletion may restrict fish populations to rough fish species (e.g. carp, mudminnows, etc.).

Human Activities and Eutrophication

Lakes naturally progress from oligotrophic to eutrophic, a process known as □ eutrophication□. Human activities can dramatically speed this process by increasing the input of nutrients (phosphorus and nitrogen) and sediment. Rapid eutrophication caused by human activities is called □ cultural eutrophication□. Most lake residents prefer the characteristics of oligotrophic lakes to those of more productive (i.e., mesotropic, eutrophic or hypereutrophic) lakes; thus controlling or preventing cultural eutrophication is a major concern for lake managers. Preventing eutrophication is far easier and less expensive than restoring lakes damaged by cultural eutrophication. The following recommendations can help lakes evaluate cultural eutrophication and decide when action is necessary.

- Monitor phosphorus and nitrogen (and, ideally, chlorophyll) concentrations so that the progress of eutrophication can be evaluated.
- Encourage best management practices for lakeshore properties, including:
  - Use of phosphorus-free lawn fertilizer.
  - Effective barriers for controlling soil erosion and runoff at construction sites.
  - Disposal of grass clippings, leaves and other plant debris away from the lakeshore.
- If concentrations of the parameters listed above are found to be elevated and/or increasing:
  - Evaluate sources of nutrients entering the lake (construct a nutrient budget).
  - Investigate possible nutrient/runoff abatement measures for critical nutrient/sediment sources identified by the budget