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## Water Quality Parameter Definitions & Interpretations -- Fact Sheet

Water quality conditions can be evaluated by long-term monitoring to identify trends and the use of Michigan's Water Quality Standards, a document that contains water quality standards for the Great Lakes, connecting waters, and all other surface waters of the State. Waters of the State may include inland lakes, rivers, creeks and streams, impoundments, and open drains. At a minimum, all waters of the State are designated for, and shall be protected for:

- ▶ Agriculture
- ▶ Navigation
- ▶ Coldwater fishery
- ▶ Warmwater fishery
- ▶ Industrial water supply
- ▶ Public water supply at point intake
- ▶ Other indigenous aquatic life and wildlife
- ▶ Partial body / total body contact recreation

The purpose of Michigan's Water Quality Standards is to (1) protect the public health & welfare, (2) enhance & maintain the quality of water, and (3) protect the State of Michigan's natural resources. The Michigan Water Quality Standards (MWQS) can be found at the Michigan Department of Environmental Quality website ([www.michigan.gov/deg](http://www.michigan.gov/deg)). There is a link to the specific site from the Kalamazoo County website (<http://www.kalcounty.com/eh/bathing-beach.htm>).

During routine monitoring and bathing beach monitoring, Environmental Health Bureau staff collects water temperature, dissolved oxygen, pH, specific conductance, and turbidity; these often form the foundation of monitoring programs. The following is a description of each parameter and specific language that pertains to Michigan's Water Quality Standards.

### **Water Temperature -- Rules 323.1069 to 323.1075**

Water temperature is an important parameter in its affect on the solubility of oxygen in water, the rate of photosynthesis by algae and higher plants, the metabolic rates of aquatic organisms, and the sensitivity of organisms to toxic wastes, parasites, and diseases. Many of the physical, biological, and chemical characteristics of a surface water system are directly affected by temperature.

Michigan Water Quality Standards state the following for water temperature:

- ✓ *"coldwater...receive a heat load which would (a) increase the temperature...at the edge of the mixing zone more than 2 degrees Fahrenheit (b) increase the temperature...at the edge of the mixing zone greater than the following maximum temperatures..."*
- ✓ *warmwater... receive a heat load which would (a) increase the temperature...at the edge of the mixing zone more than 5 degrees Fahrenheit (b) increase the temperature...at the edge of the mixing zone greater than the following maximum temperatures..."*

### **Dissolved Oxygen -- Rules 323.1064 to 323.1065**

Dissolved oxygen is a measure of the amount of oxygen freely available in water. It is commonly expressed as a concentration in terms of milligrams per liter (mg/L) or ppm, or as a percent saturation, which is temperature dependent. Percent saturation is the percent of the potential capacity of the water

to hold oxygen that is present. The DO for surface water ranges from 0 in extremely poor water conditions to a high of 15 mg/L in 0 degree Celsius (freezing) water.

Michigan Water Quality Standards state the following for dissolved oxygen (coldwater):

- ✓ *“coldwater...the dissolved oxygen shall not be lowered below a minimum of 7 milligrams per liter at the design flow during the warm weather season...”*

Michigan Water Quality Standards state the following for dissolved oxygen (warmwater):

- ✓ *warmwater... the dissolved oxygen shall not be lowered below a minimum of 4 milligrams per liter, or below 5 milligrams per liter as a daily average, at the design flow during the warm weather season ...”*

### **pH -- Rule 323.1053**

The symbol pH stands for potential for hydrogen and is a general measure of the acidity or alkalinity of a water sample. The pH of water, on a scale of 0 to 14, is a measure of the hydrogen ion concentration. The preferred range of pH for many aquatic organisms is 6.5 to 8.5. Changes in pH can be caused by atmospheric deposition, surrounding rock, and certain wastewater discharge.

Michigan Water Quality Standards state the following for pH:

- ✓ *“pH shall be maintained within the range of 6.5 to 9.0...Any artificially induced variation in the natural pH shall remain within this range and shall not exceed 0.5 units of pH.”*

### **Specific Conductance -- No Rule under Michigan Water Quality Standards**

Conductivity (reported in millisiemens / centimeter (mS/cm)) is a measure of the ability of water to pass an electrical current. It is directly related to the level of dissolved ions in the water. Conductivity levels will increase if there is an increase in the concentration of pollutants in the water. Conductivity is affected by the presence of inorganic dissolved solids, such as chloride, nitrate, sulfate, and phosphate anions (ions with a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions with a positive charge).

Soft water lakes have few dissolved ions, resulting in a specific conductance of less than 0.1 mS/cm; hard water lakes often have a conductivity exceeding 0.3 mS/cm. The conductivity should remain fairly constant for a given lake throughout the year; any significant changes over a short period of time may indicate a significant amount of precipitation or erosion that may impact the water quality.

Related to conductivity are total dissolved solids (TDS), expressed in grams / liter. The water quality instrument calculates TDS using a mathematical calculation (Conductivity reading X Scale Factor = TDS). Total dissolved solids are a measure of the amount of ions dissolved in the water.

### **Turbidity -- Rule 323.1050**

Turbidity (reported in NTU) is the measurement of lack of water clarity. Turbidity is the result of suspended solids in the water. Suspended solids are variable, ranging from clay, silt, and plankton, to industrial wastes and sewage. Turbidity affects color and temperature, which in turn has an impact on dissolved oxygen and photosynthesis.

Michigan Water Quality Standards state the following for Physical Characteristics:

- ✓ *“The waters of the state shall not have any following unnatural physical properties in quantities which are or may become injurious to any designated use: turbidity, color, oil films, floating solids, foams, settleable solids, suspended solids, or deposits.”*