Water Quality

"*Physical, chemical, and biological measurements are the tools necessary to recognize trends in water quality*" (Mitchell & Stapp 1994, p. 17).

Water quality monitoring takes many forms (Michaud 1991, p. 1):

1. *Chemical*, or traditional, method – water samples are collected and analyzed.
2. *Qualitative*, or indirect, methods:
   - *Physical* method, or visual monitoring – noting condition of the bank, presence of the shoreline vegetation, composition of the stream or lake bottom, and other physical characteristics.
   - *Biological* method – recording the abundance and diversity of insects and other organisms that can have different levels of tolerance to pollution and tell about the quality of the water.

To measure the water quality a standard index called the Water Quality Index (WQI) is used. The National Sanitation Foundation developed it in 1970. To determine the WQI, nine tests are performed:

1. Dissolved oxygen – the presence of oxygen in water is a positive sign, the absence of oxygen is a signal of severe pollution (Mitchell & Stapp 1994, p. 27). Waters of consistently high dissolved oxygen are usually considered healthy and stable ecosystems capable of supporting many different kinds of aquatic organisms.
2. Fecal coliform – type of bacteria associated with mammal and human waste
3. pH – a way to measure acidic or basic nature of water. Scale: from 0 to 14. Values higher than 7 considered alkaline and values less than 7 are acid (IWRRI, p. 76).
4. Biochemical oxygen demand (5 day) – a measure of the quantity of oxygen used by bacteria microorganisms in the aerobic oxidation of organic matter over a five-day period (Mitchell & Stapp 1994, p. 47).
5. Temperature – affects physical, biological, and chemical characteristics of a river (Mitchell & Stapp 1994, p. 51):
   - amount of oxygen that can be dissolved in water
   - rate of photosynthesis by algae and larger aquatic plants
   - metabolic rates of aquatic organisms
   - sensitivity of organisms to toxic wastes, parasites, and diseases.
6. Total phosphate – plant nutrient needed for growth, and a fundamental element in the metabolic reactions of plants and animals (Mitchell & Stapp 1994, p. 17).
7. Nitrates – nutrients necessary for growth of plants.
8. Turbidity – a measure of the relative clarity of water: the greater the turbidity, the murkier the water (Mitchell & Stapp 1994, p. 66). Turbidity increase is caused by suspended solids in water such as clay, silt or organic wastes.
9. Total solids – suspended and dissolved materials in water column (IWRRI, p.79).

The results of the tests are transferred to a weighting curve chart where their numerical values are obtained. These numerical value are multiplied be a "weighting factor" and then added – an overall Water Quality Index is obtained.

Water Quality Index Ranges

90 – 100	Excellent
70 – 90	Good
50 – 70	Medium
25 – 50	Bad
0 – 25	Very Bad

References:

Mitchell, Mark K. and William B. Stapp. 1994. Field Manual for Water Quality Monitoring. Eighth Edition. Thomson-Shore, Inc. Dexter, Michigan. 272 p.

Michaud, Joy P. 1991. A Citizens' Guide to Understanding and Monitoring Lakes and Streams. Washington State Department of Ecology. Publication # 94-149. 66 p.

Idaho Streamwalk: Learning How to Monitor Our Streams. Idaho Water Resources Research Institute (IWRRI). 80 p.