

# Water Quality Testing

## Chemistry

With chemical tests you are testing for the presence and concentration of specific chemicals. Results will only tell you about the specific chemicals you tested, not about the possible presence of other pollutants. Chemical tests also only tell you what is present in the water at the moment you test.

## Oxygen

*Importance:* Breathed by aquatic animals

*Sources:* By-product of photosynthesis, mixed in from air when water is turbulent (in riffles)

*Values:* 0-3ppm: Few organisms can survive.

3-4ppm: Only a few fish and invertebrates can survive.

4-7ppm: Most non-trout, warm-water fish species can survive.

5ppm: EPA's suggested lower limit to maintain healthy aquatic biota.

>7ppm: Necessary for trout, salmon and many invertebrates.

## pH

*Importance:* indicates the number of free hydrogen ions in the water [ $\text{pH} = -\log_{10}(\text{H}^+)$ ], too high (alkaline) or too low (acidic) a value will preclude many forms of life from living in the water

*Sources:* acid rain, mining (note: pH is buffered by the presence of limestone in the bedrock of the area)

*Values:* 0-4.0: Aquatic life is severely stressed.

4-4.5: Few fish and invertebrates can survive.

4.5-6.5: Acid-tolerant invertebrates and fish can survive.

5.0-9.0: Suitable for human consumption.

6.5-8.5: Suitable for most aquatic animals.

6.5-13: Suitable for most aquatic plants.

## Temperature

*Importance:* too high a value will preclude cold water animals from living in the river, less oxygen can dissolve in water the higher its temperature, higher temperatures promote higher growth rates

*Sources (of high temperatures):* hot water discharges (particularly power plants), lack of shade

*Values:* <13C: Suitable for cold-water species such as trout, mayflies, caddisflies and stoneflies.

13-20C: Suitable for some salmon, mayflies caddisflies, stoneflies and beetles.

20-25C: Suitable for most other fish, invertebrates and warm water species.

>25C: Lethal to trout, salmon, many aquatic insects and most cold water species.

## Phosphates

*Importance:* promotes growth, excessive levels can lead to eutrophication and fish kills and reduction in biodiversity

*Sources:* fertilizers, detergents

*Values:* 0.005-0.05ppm: Typical of undisturbed forest streams.

<0.5ppm: Suitable for human consumption.

0.05-0.1ppm: May increase aquatic plant growth.

>0.1ppm: Likely to cause algal blooms.

1.0ppm: Approximate ideal upper limit for wastewater treatment plant effluent.



## **Nitrates**

*Importance:* promotes growth, excessive levels can lead to eutrophication and fish kills and reduction in biodiversity

*Sources:* fertilizers

*Values:* 0.1ppm: Typical of undisturbed forest streams.

0.1-1.0ppm: May increase aquatic plant growth.

>1ppm: Likely to cause algal blooms.

<10ppm: Suitable for human consumption

<90ppm: No direct effect on fish

## **Turbidity and Total Solids**

*Importance:* impedes breathing of animals with gills, impedes filter feeding, impedes sunlight that leads to a reduction in photosynthesis

*Sources:* erosion, organic material

*Values:* To sustain aquatic life, 10 day average should not exceed 25NTU/JTU and no reading should exceed 50NTU/JTU.

## **Fecal Coliform**

*Importance:* is a bacteria that though not pathogenic itself, is an indicator for the presence of human feces and thus the potential for the presence of pathogens

*Sources:* leaky septic systems, combined sewer overflows

*Values:* To be safe for swimming there should be no more than 250 colonies/100 ml.

## **Aquatic Macroinvertebrates**

Macroinvertebrates are small (but still visible to the naked eye) animals without a backbone that live in rivers, lakes and ponds. Species vary in their tolerance to pollution. Thus the presence or absence of different species can be used to get a sense of the quality of the river and its habitats. Results do not pinpoint a specific cause of degradation. Since macroinvertebrates live in the water for a year or more, the results give you a general sense of the quality of the river over time. Since macroinvertebrates do not travel far they are good indicators of the health of a particular location.

## **Habitat**

By observing the condition of habitats within the river, along the banks and the general land use of the watershed upstream of your location, can give you clues as to what factors may be contributing to the health (or poor health) of your site.

