Aquatic Indicator Organisms PowerPoint Outline

How can we use living things as indicators of water quality?

All organisms need certain conditions to survive and multiply. Since each aquatic organism has specific tolerances of chemical and physical conditions, the presence or absence of particular organisms can tell us a lot about the body of water we are studying. Compared to complex chemical analysis, using surveys of organisms to determine water quality can be done relatively simply and effectively.

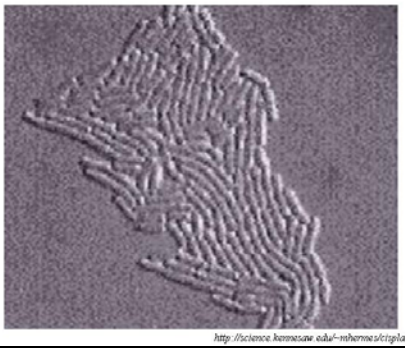
Indicators

A species which is normally present in an aquatic ecosystem under specific conditions is called an indicator organism.

Pathogens as water quality indicators

Bacteria are an example of a pollution indicator organism. Pathogens are of great importance in the study of water quality. Many diseases around the world are linked to the water as a carrier for bacteria, viruses or parasites. All water samples being inspected or tested for human consumption should be tested for coliform bacteria. An intestinal bacteria, Esherichia coli is often associated with fecal material.

Esherichia Coli (E. Coli)



http://science.kennesaw.edu/~mhermon/cirplat/cirplat01.htm

E. Coli Colonies on Agar Plate

http://www.bact.wisc.edu/Bact330/lectureecoli

Fecal contamination in water

An agar plate inoculated with stream water that grows E. coli will be suspected of fecal contamination due to the presence of the bacteria.

Dissolved Oxygen, (DO) and Pollution
Pollution often affects the level of dissolved oxygen in the water. Certain organisms cannot live in areas of low DO, they serve as a biological index for monitoring the health and pollution levels of freshwater.

Dissolved Oxygen Testing

Collecting Aquatic Organisms

Finding out about water quality by collecting organisms
Scientists studying water quality have developed and index system for classifying streams by counting the number and categories of macroinvertebrates present in the stream community. If lots of organisms that are intolerant of low oxygen levels are found living in the stream then the water quality is assumed to be good. If only the only organisms that can be found are those that tolerate low levels of dissolved oxygen, then the water can be considered poor quality and possibly polluted.

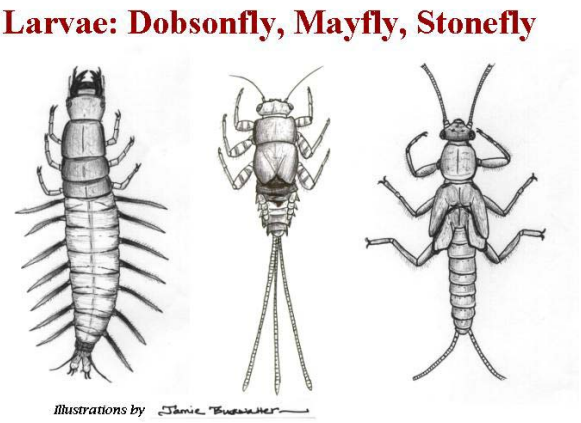
It is important to note however, that some aquatic communities are naturally low in oxygen or will go through low oxygen phases. For example, it would be unreasonable to expect a pond community to have the same habitat conditions as a fast flowing stream.

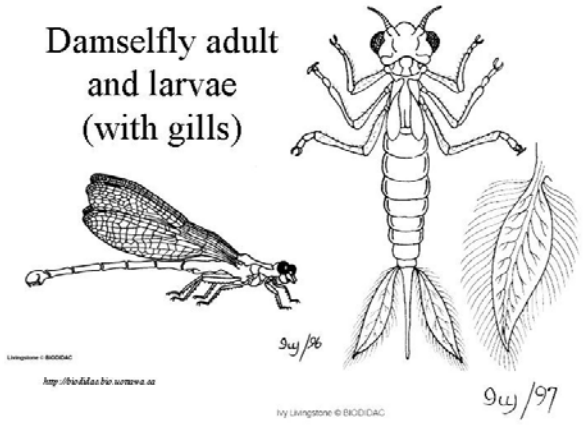
Ponds and other still waters absorb more of the sun's heat energy and retain it for longer periods of time, so they tend to be warmer than fast flowing streams. Because of this heat retention and lack of motion that would incorporate oxygen, ponds are usually much lower in dissolved oxygen than streams. This critical difference affects every aspect of the pond food web. Therefore, biological indexes designed for fast flowing streams cannot be used to accurately assess the water quality of ponds.

- Fast running streams with cold water - high dissolved oxygen levels.

- Still, shallow bodies of water - low dissolved oxygen levels.

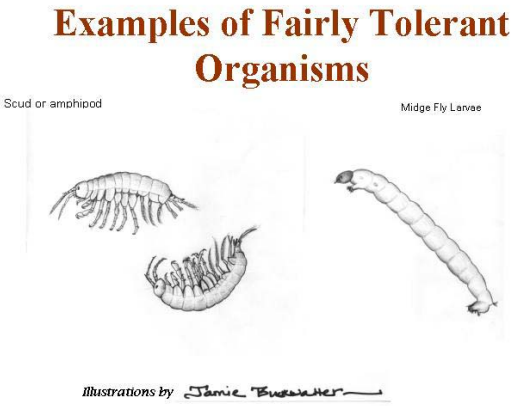
Pollution- Intolerant Organisms
These organisms need high levels of DO and are sensitive to chemicals and fertilizers. The quality of water needed for these organisms is very high. Examples: Dobsonfly Larva, Stonefly Nymph and Water Pennies.

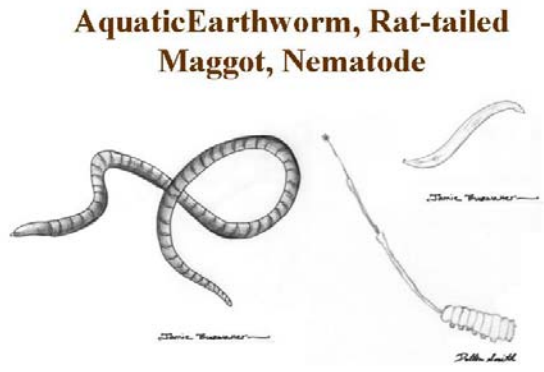




Moderately Intolerant Organisms
These organisms can survive in areas with low levels of nutrients from farm run-off, occasional sedimentation, medium to low levels of DO fluctuations in the water. Examples: Mayfly Nymph, Damselfly Nymph, Caddisfly Larva and Crayfish.

Fairly Tolerant Organisms
These organisms can survive low DO, and medium to high nutrient levels. Many of them are scavengers or bottom feeders. Examples: Midge Larva, Snail, Black Fly Larva, Scud





Pollution- Tolerant
Organisms can survive low DO, high nutrient levels, sewage and sedimentation. Most of these organisms are bottom feeders and actually eat the organic material that may be clogging the streams. Examples: Nematodes, Aquatic Earthworm and Rat-tailed Maggot.