

Invertebrate Pollution Tolerance

Caged canaries were once taken deep inside coal mines to alert the miners of deadly, odorless gases. If a canary died in its cage, it was time for the miners to quickly evacuate to the surface.

In a similar way, benthic (bottom dwelling) invertebrates can indicate the presence of pollution in a river. Some invertebrates are very sensitive to pollution and quickly die off.

Invertebrates are good "bio-indicators" of pollution for several reasons:

- Invertebrates are **basically stationary** even though the river is constantly moving past them. The impact of any pollution can be seen in the surviving organisms long after all traces of a chemical have been washed away.
- Invertebrates have a **relatively long life cycle** of one to three years. They are available to measure pollution over long periods and at low concentrations.
- If scrapers or collectors become more common, they may be an **indicators of organic nutrient pollution** and increased algae growth.
- If the water quality has been impacted by pollution, it will be home only to those invertebrate species that are tolerant of pollution and these may be **present in very great numbers**.

It should be noted that surface-breathing invertebrates such as water striders, lunged snails and adult beetles do not depend on dissolved oxygen and therefore have limited use as bio-indicators of pollution. They may be able to live in oxygen poor water by breathing with surface air.

"Chemical measurements are like taking snapshots of the ecosystem, whereas biological measurements are like making a videotape."

- Professor David M. Rosenberg, University of Manitoba

Types of Pollution

Pollution is any substance that has a negative effect on living things. There are several categories of pollution including sediment, toxic chemicals, warm water and organic nutrients.

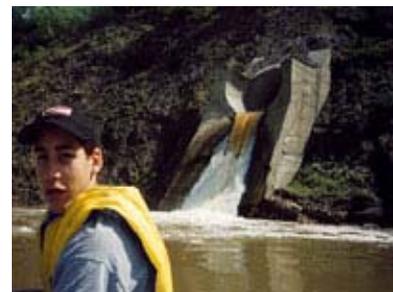
Sediment Pollution

Particles that wash into a river may originate from street runoff during storms or during spring snowmelt. Sediment can also originate from construction areas, trampled banks or flood events.

- Measuring the turbidity (clarity) of the water can serve as a test for sediment pollution.

Sediment pollution does damage when suspended particles gradually settle over the river bottom. The effects of sediment pollution can include:

- reduced number of invertebrates and invertebrate types
- smothering and killing fish eggs, algae and invertebrates
- murky water that blocks sunlight for photosynthesis
- rocks and plants covered in silt



Stormwater Outfall

Toxic Pollution

Chemicals that are harmful to life can originate from storm sewer outlets, water treatment plants, factories, rail yards, lawns, golf courses and mines. These chemicals can include paint, diesel fuel, chlorine, oil, acid, pesticides, herbicides and heavy metals.

- Analysis of invertebrate data can serve as a measure of toxic pollution. Testing for specific toxins is usually beyond the scope of school and public monitoring programs.

The effects of toxic pollution can include:

- reduction or absence of all types invertebrates
- water appears clear and clean



Industrial Outfall

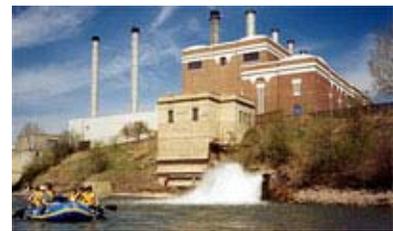
Thermal Pollution

Human activities can return warm water to a river. Sources of thermal pollution can include power plants, wastewater treatment plants, fish hatcheries and oil refineries.

- Recording changes in water temperature can document thermal pollution.

The effects of thermal pollution can include:

- increased water temperatures
- increased plant growth
- slowing of river velocity because of plant growth
- fewer kinds of invertebrates
- large numbers of pollution tolerant invertebrates
- lower dissolved oxygen levels



Power Plant Outfall

Organic Nutrient Pollution

Too much of a good thing can be harmful to life. While nutrients are necessary - like nitrogen and phosphorus - too much can result in massive algae and plant growth. Excessive plant growth can be followed by oxygen depletion as dead plant material decomposes and bacteria uses oxygen. Lower oxygen levels can result in fish kills.

- Organic nutrients can originate with human and livestock wastes, feedlots, meat packing plants, sewage and fertilizer runoff from yards and farms.
- Invertebrate data can be used along with testing nitrogen and phosphorus levels to measure of organic nutrient pollution.

The effects of organic pollution can include:

- fewer kinds of invertebrates
- large numbers of pollution tolerant invertebrates
- an increase in collectors and scrapers such as caddisfly larvae or roundworms
- unpleasant odors
- rocks covered in algae
- excessive weed growth
- high concentrations of nitrogen and phosphorus
- lower oxygen levels



Sewage Outfall