Keeping our water clean

We are dependent on water for domestic use, so you would think it would be important for us to keep our lakes and rivers as clean as possible. Sadly, clean water has not always been a prime consideration for society. Too often lakes and rivers have become the dumping ground for waste products from industrial, domestic and agricultural sources, thereby polluting the very water we need to keep clean. Water used for human consumption needs to be of a certain quality, in other words — potable. This article looks in more detail at the ways in which potable water may be rendered unfit for human consumption (or, indeed, consumption by other animals) as the result of pollution.

Industrial pollution has often arisen in the past as the result of ignorance. Industries were frequently permitted to discharge their untreated waste products into lakes and rivers. Only later did the harmful consequences of these products become apparent. An example is a river in Florida, USA where there are warning notices advising people not to catch fish. For many years this river received untreated waste, containing dioxin, from a wood-pulp mill. Dioxin is a by product of the chlorine bleaching process used to clean the pulp; it is an extremely toxic chemical that is thought to cause skin disease and increase cancer risk in humans and has been shown to cause sterility in fish and alligators. Switching to an alternative technology that uses oxygen could avoid this. In other instances, the discharge of harmful substances into our waterways is less obvious; for example, rainwater seeping through the waste-tips of old lead mines dissolves the lead, and carries it into rivers.

Among the pollutants from industry are metals such as lead and mercury, which are toxic above a certain concentration. Once they get into the water cycle, they begin to accumulate at various points along the way. They become incorporated into the muds of lakes and estuaries, and they build up in the tissues of plants and animals that live in the water or grub in the mud for their food. As these organisms are eaten by others, the metals become steadily more concentrated in the tissues of the predators until they reach levels that may become life-threatening. If we eat fish and shellfish from these polluted waters, then the lead and mercury will find their way into our bodies, too.

It isn’t only industry that is responsible for polluting our lakes and rivers with metals. Individual human beings are equally culpable. In 1979 it was estimated that around 3 000 mute swans in the UK could be dying of poisoning as the result of eating the lead weights that were carelessly discarded by anglers after a day’s fishing. Fortunately this number has decreased significantly now that weights are made of different materials. You don’t have to be an angler, however, to contaminate the water supply with lead. You may live in an older house that still contains lead water

pipes. As water passes through the pipes, a little of the lead is dissolved and so enters the water cycle. One side effect of both lead and mercury poisoning is brain damage. You may already know that the saying ‘as mad as a hatter’ is derived from the days when mercury was used in the manufacture of men’s top hats.

Pollution from domestic sewage can lead to more than one sort of problem. Most obviously, sewage is a source of water-borne diseases such as cholera and typhoid fever. A second problem with sewage is that the bacteria that break it down, during a process called respiration, use dissolved oxygen from the water to do so. This same dissolved oxygen also supports the other aquatic life. The more sewage there is in the water, the more bacteria are required to break it down and the more dissolved oxygen they use, leaving less oxygen for fish and other aquatic animals. Once the oxygen in the water is used up, animals that need oxygen die. It isn’t long before the water begins to smell distinctly unpleasant due to the gases released when the sewage begins to be broken down by bacteria that can live without oxygen. If you’ve ever stirred up the mud at the bottom of a stagnant pond, you will know exactly what we mean.

Agricultural activities pose problems through both crop spraying and the use of fertilisers. Crop spraying is carried out to prevent damage to crops from weeds and various forms of pests. However, such spraying can disperse herbicides and pesticides over a wide area so that they end up in water that drains into rivers and lakes. In high enough doses these pollutants may be toxic and, like lead and mercury, they can accumulate in the tissues of animals and so end up in our bodies too. Fertilisers contain nutrients, substances essential for the healthy growth of all plants and animals. However, when fertiliser seeps into lakes and rivers by drainage off the land it can lead to excessive plant growth. As a lake surface becomes covered with water weed, oxygen can no longer be dissolved in the water to replenish what is being used by fish and other aquatic animals. Once again, starved of oxygen, the animal life soon begins to die, and the water becomes stagnant and foul-smelling.