Clean water is key for wildlife ponds

By Ian Thornhill Reviewed by Steve Head

The key to a pond packed full of wildlife is a good quality water source that is low in nutrients and pollutant free. The best way of ensuring that this is the case is to let your pond fill naturally. For this to happen it will be best to build your pond during the autumn and let it fill over the winter. Alternatively, you could collect a fresh supply of water in a water butt, but do consider the surfaces from which the water is being collected.

Above all, it is really important to use tap water as a very last resort. This is because tap water is typically quite high in nutrients such as phosphate and nitrate. Any excess of nutrients is likely to cause an excessive growth of algae and less desirable plants. This eutrophication problem is a parallel to the dominance of grass over wildflowers in a failing wildflower meadow. If tap water is your only option, then it will be best not to plant and develop your pond until several weeks have passed since filling as this will give some the chlorine and perhaps the nitrates the opportunity to dissipate.

There are several aspects of water quality that can be monitored through off the shelf products, as follows.

Nutrients

This broadly refers to levels of nitrates and phosphates, which are key to plant growth. The weathering of rocks and other mineral deposits results in the release of phosphate ions which readily dissolve in water. Typically, the level of phosphate in aquatic systems limits the amount of plant growth whereas nitrate is usually more abundant. As a rule of thumb, if phosphate levels exceed 0.1mg/l then the system is likely to be out of balance and a process called eutrophication may occur. In brief, this is where the system reacts by producing more phytoplankton/vegetation than can be consumed, resulting a large amount of decaying matter. The most notable impacts are low dissolved oxygen levels and a decrease in species diversity. For more detailed information see this US reference.

In the UK, regulations in force since December 2013 require that drinking water from a customer's tap should contain no more lead than 10 µg/l. Lead piping in old hoses, and lead in copper pipe solder can leach out and cause low level but significant toxicity. To avoid this happening, many water companies (especially in soft-water areas) add phosphate to tap water, which effectively stops the lead dissolving by forming a protective layer. Phosphate at a concentration of about 1mg/l is routinely added. This is an order of magnitude (10x) higher than the average EU river concentration or that which would be regarded as allowing good status in rivers under the Water Framework Directive. It is not surprising therefore that garden ponds routinely filled with phosphate dosed tap water tend to become eutrophic and algal dominated as concentrations build up with repeated topping-up.

It is important to keep nutrient concentrations in ponds low for them to be as biodiverse as possible. This means avoiding letting run-off from a fertilised lawn of flower bed was into the pond. As vegetation dies back in the autumn, remove it for compost, and it will carry away some of the nutrients locked up in plant tissue. If fresh plant growth is very vigorous, remove the excess, but give beasties time to escape back into the pond.

Dissolved oxygen

Oxygen levels are affected by consumption by animals, production by aquatic plants, exchange at the surface (best on windy days) and temperature. Oxygen levels will naturally increase under lower temperatures (during winter for example) and decrease when things warm up. If the system is imbalanced, such as through an excess of nutrients, dissolved oxygen levels can plummet during summer. In summer, higher temperatures, lower water levels and more decaying matter (and therefore more decomposing bacteria) all conspire to lower dissolved oxygen levels. Pond organisms are naturally adapted to handle relatively low oxygen levels, but, as oxygen levels decrease below around 40% saturation some fish and more active invertebrates may begin to suffer.

pH

Pure rain water is typically ever so slightly acidic (less than neutral pH 7) but changes as it interacts with the environment. Typically this means that it will gradually become more alkaline (more than pH 7), but not always. For example, if your pond receives a lot of leaf input, particularly pine needles, the pH levels are likely to be lowered. Similarly, carbon dioxide breathed out as animals respire will convert to carbonic acid and lower pH levels. On the other hand, as plants photosynthesize carbon dioxide will get used up and increase pH. If plant growth is excessive then pond water will gradually become alkaline.

If you must use tap water, whether you have hard or soft water will have an impact. The healthiest ponds are likely to have a slightly alkaline pH but thankfully, most pond organisms are just fine with a pH that ranges between 6 and 9.

Conductivity

Electrical conductivity is catch-all measurement of water quality and is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulphate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminium cations (ions that carry a positive charge). The natural level of conductivity within streams and rivers is mainly a result of the catchment geology. However, the introduction of pollution such as sewage or the “grey water” from your home can affect the electrical conductivity reading. Conductivity is measured in micromhos per centimeter (µmhos/cm) or microsiemens per centimeter (µs/cm). Measurements in the region of 50 to 1500µs/cm are not uncommon in ponds, and few garden ponds manage a conductivity less than about 150 µs/cm[1]

[1] Biggs, J. 2009 The Big Pond Dip Proceedings Wildlife Gardening Forum Conference November 2009 wlgf.org/November%202009%20Proceedings.pdf