

Problems with Algae and Duckweed

Our garden pond is the colour of *pea soup* and the village pond is covered in *duckweed* - why does this happen and what can we do?

A pea-soup coloured pond is caused by tiny green planktonic algae in the water. This problem, together with problems with filamentous algae (often called blanket weed or cott) and small floating-leaved species like duckweed and water fern, all have the same route cause - too many nutrients in the water - especially nitrate and phosphate.

These problem plants are very tolerant of nutrients and where nutrient levels are high they can grow very rapidly.

New ponds or ponds that have recently been dredged often have temporary problems with pea-soup algae which persist for a few months. Such blooms are usually short-lived, and should cause little worry. It just needs patience - the system will settle down within a season or two.

Older ponds which have a persistent surface cover of duckweed or green-coloured water are of more concern. In these cases, the nutrient pollution is often caused by one or more of the following:

- fertiliser applied to gardens or fields which leaches into the pond;
- runoff from bare or disturbed soils;
- duck or livestock faeces;
- addition of food stuffs, such as bread or corn to encourage ducks or feed fish;
- nutrients in the water supply (e.g. stream inflows or top-ups with tap water);
- sewage, silage or farmyard run-off;
- runoff from urban surfaces such as roads and pavements.

Anything that continually stirs up bottom sediments will also release nutrients from the pond's sediments into the water - this includes bottom-feeding fish and ducks.

Box 1. Common sources of nutrients that pollute ponds

Garden ponds

- Tap water
- Soil or turves added to the pond bottom
- Bare soil next to the pond, which can be washed in by rain
- Fish: food and faeces add pollutants. In addition, fish stir-up bottom sediments, releasing them into the water. Fish also eat zooplankton that would otherwise clear the algae!

Countryside ponds

- Fish stirring up bottom sediments
- Water birds: food and faeces if there are unnatural numbers encouraged by feeding
- Inflow streams, ditches or drains – commonly bring in polluted silt and water
- Run-off from roads and other urban surfaces
- Runoff from fields, particularly arable
- Runoff from yards, septic tanks, silage, soil or manure heaps

Is it a problem?

Moderate amounts of filamentous algae and duckweed should not be a cause for concern.

Both occur naturally in ponds. Algae provide food for many pond creatures, they produce oxygen and filamentous algae in particular, often have large numbers of small pond animals sheltering amongst it. There are even tiny aquatic beetles which live out their lives within duckweed fronds.

Before doing anything drastic, check which duckweed you have (see box 2), some are quite uncommon – and you might want to keep it!

Most people will, however, have Common Duckweed (*Lemna minor*), or perhaps the alien species, Least Duckweed (*Lemna minuta*), which looks very similar.

The problems with these nuisance plants really begins when they start to occur in abundance, making the water cloudy or forming thick surface mats across the surface which can look unsightly.

They can also cause problems for wildlife, because they blocks out light to submerged aquatic plants. Surface cover of duckweed or water fern can also prevent exchange of gases with the air so that the underlying water can become de-oxygenated and noxious to many aquatic animals.

Options for dealing with algae and duckweed

Dealing with algae and floating plants like duckweed can be difficult - particularly at sites larger than garden pond size.

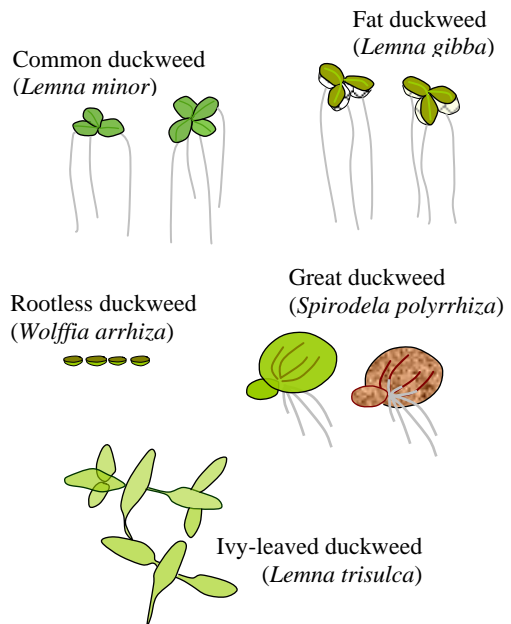
In the long-term the best solution is to tackle the underlying problem of nutrient enrichment if this is possible. Other methods are less satisfactory because they only deal with the symptoms, so continued treatment is almost always needed.

New ponds

As noted above, new ponds usually have green water during their first few months. This happens because microscopic algae grow fast in the water. Their natural predators, zooplankton (such as water fleas) take much longer to build up their numbers – so new ponds may remain green and cloudy for 6 months or more until there are enough zooplankton to eat the algae and clear the pond. There's little you can do to speed up this natural process – zooplankton arrive on their own (their eggs are very light and blow around in the wind, and they are also transported between ponds by larger pond animals).

Don't be tempted to add sludge or water from another pond – we've tried it – there will be few zooplankton in a bucket or two– so and it makes little difference to the natural colonisation process, and can cause long term problems by adding nutrients or other pollutants to your pond.

Box 2. Types of duckweed



Know your duckweeds

It's worth quickly checking which duckweed you have. There's a chance you might have Fat Duckweed or Great Duckweed which are quite uncommon plants and worth protecting. If you live near the Somerset Levels or the south Kent coast you may see Rootless Duckweed - at 1 mm in diameter and looking like a green grain of sand, it's Britain's smallest flowering plant and one of the rarest

Manual clearance

In small ponds, you can temporarily clear blanket weed using a rake or by twisting it on a stick. Duckweeds and Water Fern can be scraped from the surface using a board or a sieve.

This not only removes the plants but also removes the nutrients that are locked-up in the plant tissues. By repeatedly removing floating plants, you can gradually reduce nutrient concentrations in the pond. But you may need to do this many times. It can be slow work: it's impossible to remove all plants, so some re-growth is inevitable. Duckweed can double in area every 3 days in summer – so regular removal is important. Make sure you dump the collected plants well away from the pond (a compost bin is ideal) – so when it rots down the nutrients don't simply wash back into the pond.

And if nutrients are still regularly getting into the pond from other sources (see Box 1), it won't solve the problem and removing plants will need to be continued in the long term.

Encouraging submerged plants

Ensuring that the pond has lots of *submerged* aquatic plants (often called *oxygenators*) can help soak-up the pond's nutrients before the nuisance plants can get hold of them. Beware though - our native submerged plant species will not grow in heavily nutrient-polluted water - so only think about adding them when other methods (such as dredging out sediments), have been used to clean up the water quality. Even then, submerged plants can be fussy and difficult to establish - so try small amounts first to see if they are likely to survive.

When adding plant species to ponds, use only native aquatic species, ideally from a nearby source, ensuring you have permission. If possible avoid stock from garden centres: few supply native submerged aquatic plant species. See our leaflet "planting up ponds" for more details of suitable species to introduce

<http://www.pondconservation.org.uk/advice/faq>

Shade

Shade can reduce problems with algal growth – so it's no bad thing to locate your pond in a moderately shady place (rather than the "full sun" location that is too often advised!). Planting dense shrubs or trees to the south will have a similar effect. Similarly larger leaved floating plants like amphibious bistort (*Persicaria amphibia*) or broadleaved pondweed (*Potamogeton natans*) can provide shade on the water surface.

However, although increased shade may check the growth of algae, it won't eliminate problems in nutrient-enriched ponds – so ponds could still develop a cover of duckweed – and only very deep shade will deter duckweed!

Marshy areas

Ensuring that there are extensive areas of shallow-water organic soils and marsh plants around a pond edge can get rid of some nitrate in the water. This is because these wet soil areas are excellent at transforming (denitrifying) nitrate into nitrogen and oxygen gases which then naturally disperse to the atmosphere. Unfortunately though, you can't get rid of phosphorous compounds to air this way, so marshy areas are only ever a partial answer.

Barley straw

Barley straw when placed in water, rots down to produce a range of chemicals that kill many

types of algae (both planktonic and filamentous). However, it won't affect duckweed.

It usually takes 2-4 weeks for the straw to become active, and it's best to add the straw in spring and remove it when it has turned black - usually about six months later.

Barley straw - like all additives, is a 'quick fix' treatment, not a cure. So application will usually need to be continued indefinitely to keep algae at bay. And because it doesn't get rid of the underlying nutrient problem - the pond may develop other problems in the longer term. We have, for example, seen village ponds where barley straw was used successfully to get rid of algae - but the next year the pond was covered in a sheet of duckweed instead!

However, one option which has worked at some sites is to clear the water using barley straw (or other chemical methods, see below), then encourage submerged plants to grow. These soak-up the excess nutrients (see "submerged plants" section above), and may prevent algal and duckweed problems reoccurring in future.

For garden ponds, barley straw can now be purchased from garden centres either ready netted-up into small bags or as a bottled extract. For larger sites you can loosely pack the straw into 'sausages' using the netting used for Christmas trees. Good information on this method is available from the Centre for Aquatic Plant Management <http://www.ceh.ac.uk/index.html>

Some research shows that rotting tree bark may also be effective at removing algae (tannins from bark may be the controlling chemical) - a good reason for leaving fallen branches in the water. Willow is thought to be particularly effective.

Garden pond pumps and fountains

Duckweeds and some types of algae prefer still water so increasing the disturbance of the water can reduce their dominance. A garden pond pump which circulates about 50 percent of the water per hour can be effective against many algal species. A fountain can reduce duckweed cover by increasing the amount of surface disturbance.

Garden pond filtration systems

You can buy a wide range of pump and filter systems that will strip out nutrients and algae from garden ponds leaving the water clearer. There are a number of different types, including biological filters and ultraviolet (UV) light-based systems. These can be run alone, or if you have fish, better in combination.

Fish keepers, in particular, usually have fairly serious filtration systems going permanently on their ponds. This is necessary because ponds with lots of fish usually also have a lot of nutrients in the water from the fish faeces, excess food and just simply fish stirring up nutrients from the bottom sediments.

The disadvantages of these systems are that, although effective when properly set up and established, they are expensive bits of kit, which need researching to make sure you get the right system. They are an effort to put in, take time to become effective and need regular maintenance to clean filters and replace parts.

Filter systems can also kill other pond wildlife: their pumps sometimes have quite wide mesh over the intake – which can draw in and trap animals as big as tadpoles, let alone tinier creatures. UV-type filters work by destroying DNA, so in addition to nuisance algae they will kill other tiny water creatures including the young of newly hatched animals like mayflies, water bugs and shrimps.

Pond dyes /colorants

Pond dyes are often a preferred method for preventing and reducing algae. They work by blocking some wavelengths of light, so that algae cannot grow. The dye degrades naturally over a number of weeks and then needs to be reapplied to remain effective.

Although non-toxic to animals, there are disadvantages from using these dyes, because they also kill the larger submerged pond plants you want to flourish to absorb nutrients!

Chemical and other treatments

Chemicals, including Copper sulfate based solutions, can be used to control algae. Use cautiously as they can be toxic to other plants and aquatic life.

Various other treatments have also been promoted by manufacturers in recent years including magnetic systems, bacterial, ozone and chlorine treatments. Some aim to lock-up nutrients in the sediments so nuisance plants don't grow, others offer short-term control by killing algae. We have little direct experience of these products, or their effectiveness in nuisance plant reduction or their possible side-effects on other pond life, so go cautiously.

Long term solutions - prevention

Most of the methods for dealing with nuisance plants outlined above are short-term fixes, which deal with the problem, but not the underlying cause. In the long term the best solution is to deal with the conditions that caused these plants to grow in the first place.

Identify the most likely causes by looking at the common sources of nutrients listed in Box 1. Then seek to reduce them.

In garden ponds this may involve (i) removing bottom sediments from the pond - since these store nutrients (ii) minimising the amounts of soils or fertilisers running into the pond from the surrounds (iii) using rain water, not tap water, to top up the pond in summer.

In larger countryside ponds, reducing inputs may involve (i) buffering the pond against run-off or spray drift, (ii) breaking or re-routing agricultural or road inflow drains or (iii) partial or complete dredging.