

Subject: Ferrensby Pond Recommendations
From: "Harrogate Aquatic" [REDACTED]
Sent: 13/03/2025, 16:30:35
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Attachments: Wildlife Fact Sheets.pdf

Good afternoon Jonanthan (and Julie and Frank!),

Thank you for your time on Monday evening, I hope you have warmed up again by now and are sitting comfortably!

I've listed your water test results below. To some extent they don't help us much, as the microscopic parts of your ecosystem (bacteria, fungi etc) are virtually dormant when the water temperature is this cold, so the fact they are all reading 0 can just mean that organic waste is preserved and not breaking down yet, rather than there not being any organic waste (with your duck population I think this will be the case!).

WATER TEST RESULTS

Nitrate 25 mg/l
Phosphate 0.2mg/l
pH 8.4
Ammonia 0
Nitrite 0
KH 7

The ones coloured **green** are the ones responsible for feeding algae and plants.

- The phosphate is higher than we'd want - a level over 0.025mg/l causes algae so yours is 10x this. This might be caused by duck poop (very rich in nitrogen and

you're looking at. This might be caused by duck poop (very high in nitrogen and phosphorus) or simply from agricultural run-off or last year's decomposing plant matter. The fix in a natural pond like yours is to get lots of fast-growing nutrient-hungry plants established to strip out the excess before algae takes over.

- Nitrate is the end product of organic waste breakdown, so duck poop and every autumn leaf and dead piece of algae decomposes to make this level higher. To fix this, you should manually remove any autumn die-off from plants before they decompose in the water, or just accept the levels will naturally build up and try to add more fast-growing plants to use it up and out-compete the algae. Levels over 3mg/l cause algae.
- The pH is too high at 8.4, so it would be worth checking this again further into the season to see if this is always the case for you. Usually, stable bodies of water like yours tend towards acidic readings, particularly after lots of rain (rain is usually acidic having reacted with atmospheric pollutants to form sulphuric acid or carbonic acid). When ponds are alkaline, it is usually a result of a localised environmental influence, like the presence of concrete/cement/limestone. It is possible that the cobble base you mentioned has been set in concrete and this is having a buffering effect, in which case this could be a long-term pH level for your pond. Most wildlife and ecosystem microbes will adapt to function at this level, but most submerged aquatic plants need the pH to be no higher than 7.5. If the pH is outside the preferred range, it affects what macro and micro nutrients are available to the plant. This might explain why you have struggled with the hornwort/starwort etc?
- The ammonia and nitrite are 0, which is most likely just that the water temperature is too cold for bacteria to be breaking down organic waste and releasing these.
- The KH (carbonate hardness) is the measure of carbonate and bicarbonate ions and determines how stable the pH stays and whether the plants and algae can photosynthesise/grow. Your level is 6 °KH, which is fine but higher than we'd expect with our local water, which again suggests there is a source of calcium carbonate buffering the water.

Conclusion

The high phosphate and nitrate levels will cause algae unless you can get some fast-growing plants established, which I think you already knew!

Plant Options

In an ideal world, with perfect water quality and predictable weather(!), you would want to aim for 65-75% of the surface to be covered by plants to block sunlight from causing algae in the water. You would have a mix of free-floating plants on the surface and loose oxygenators growing just below the surface. Marginal plants in the shallows and banking would trail across the water, with their leaves and stems providing shade and their roots soaking up nutrients. Spring would arrive gradually and predictably, and plants would get going before the algae. The water would stay clear, allowing underwater plants access to light and giving them the energy to grow quickly. Sadly we rarely get a spring like this now!

Challenges in your pond...

- **Lack of water flow** as there isn't much water movement and plants aren't motile

Each of water flow as there isn't much water movement, and plants aren't moving, your plants are reliant on getting everything they need in the spot they are growing in. This means that once they have used up all of the fertiliser/vitamins/minerals/oxygen/carbon dioxide in their immediate area they will stop growing. It is a race/survival of the fittest in each area of the pond so you will get plants bolting and then pausing in line with available resources rather than steady/strong growth. Once plants run low on nutrients, they have to conserve energy for the survival of the plant and often jettison leaves, which leads to localised decaying leaf matter, which further depletes oxygen levels while the bacteria break this down. Once broken down, this becomes fertiliser and can kick off another growth spurt if the plant has everything else it needs to grow, but could just as likely trigger an algae bloom which hogs nutrients and blocks light to the plants. Plants with their leaves under the surface release oxygen as the waste product in photosynthesis when the sun is shining, but they use oxygen 24/7 at the same time in their normal respiration just like we do. This can be a problem in a body of water with no other oxygen source (e.g. running water) as the plants can use up all available oxygen on a cloudy day or during the night. This can be catastrophic to bacteria populations and the smallest end of the food chain, and have a domino effect on the whole ecosystem. To an extent, the ducks are helping add oxygen/water movement by paddling around, but on the flip side of that they are making a lot of mess in the process!

- **Ducks churning up the silt:** the foraging action of the ducks causes a lot of silt and suspended dirt in the water, which will absorb/block light to underwater plants and physically settle on the leaves, interfering with their ability to photosynthesise.
- **Ducks polluting the water:** their waste causes high levels of nitrates and phosphate. I have done some reading on the problems with feeding ducks with bread and everything I read aligns with 'don't do it!' Basically it fills them up on carbs and stops them foraging for food that contains the nutrients they need. Long-term they can get bone deformities or stunted growth. This was a good/concise article on it: [What happens when ducks eat too much bread? - The Environmental Literacy Council](#) . The suggestion for a healthy alternative if you want to keep encouraging people to visit/feed/engage is to use oats or frozen peas, and I'm sure the country store you mentioned will do a suitable duck pellet option.
- **Ducks eating the plants faster than they can grow:** ducks eat most plants and it's an important part of their diet. The ones they don't eat tend to be tougher grasses/reeds/rushes. All the softer-textured plants will be eaten quickly unless they can be protected while they establish.
- **Oxygenating plants all gone:** this could be because the pH is nearly 10 x higher than it should be; or because the water is too turbid/murky to allow it to thrive; or because there isn't enough water movement; or because the ducks are eating it! Either way, it's looking like it isn't the right environment for the traditional 'oxygenators' to thrive.
- **Ducks or visitors eroding the shore:** this isn't really a problem to the health of the pond unless marginal plants are trampled/lost in the process. Could a beach area be created with cobbles or slabs or something like that? Does one of your local farmers have a scrap pile of small ploughed-up stones to donate? This also works well to allow wildlife like hedgehogs to drink safely and find solid ground to scramble out if they fall in.

Solutions

Obviously, the answer is plants, but I think a lot of the usual go-to plants would be a waste of money thanks to your feathered friends!

Lilies: the Brandy Bottle and White Water Lilies are an excellent choice as they are native and fast-growing. Typically they would be placed fairly deep, but in your case it might work better to have them about 18" below the surface so they are getting high levels of light to kick off their growth. They could have their rootball/rhizome tethered to some cork and an anchor line to let them float in the water column. We have both plants during the growing season and they are normally £17-£20 for potted specimens, depending on size. We also do loose lilies at £6 each if you buy them in multiples of 5, if this would be a more cost-effective option for you?

Oxygenating plants: possibly a non-starter given the challenges outlined above, but you could perhaps start some hornwort in protected cages (submerged upturned hanging baskets or something creative made of climber mesh etc). It's even fine to use chicken wire in a large pond like yours as any rusting/metal contamination won't be toxic when it's so diluted. As long as the mesh is about 25mm apart and rigid/semi-rigid it isn't a risk for entangling wildlife (loose fishing net style netting shouldn't ever be used). The mass of submerged/rafting plants that were dominating in Julie's photo may turn out to be the only plant in that category that can tolerate the high pH and keep up with the ducks, in which case, embrace and admire it, whatever it is! (Possibly *Persicaria amphibia* - Water Knotweed?). Water Soldiers (*Stratiotes aloides*) are brilliant and possibly spikey enough not to be nibbled by the ducks - you could try a few and see how they go? These float loose near/poking through the surface in warm weather and sink in cold weather. Watercress (*Nasturtium aquaticum*) is an excellent option to grow in the shallows - it's fast-growing and rafts nicely across the surface, given the chance. It will really help with water quality if you can shield it from the ducks! This can be grown really easily from seed - maybe you could get any green-fingered villagers to grow you a bucket-full each to contribute to the pond? It will also grow from cuttings, so you could propagate/colonise extra areas really easily. Water Mint (*Mentha aquatica*) is also a good option but potentially *too good* - it can be a bit of a thug for spreading where you don't want it!

Marginal plants: these are grown at the edges/banking and like to have wet roots but dry leaves as a general rule. Some, like reeds/grasses are really important for providing structure/stability to the banking and tall stems for spiders to spin webs between (helping keep down your midge/mosquito population in summer). Some provide cover for wildlife to come and go safely. Many of them flower and attract/sustain pollinators. Some have leaves emerging from the surface that give dragonfly/damselfly nymphs somewhere to climb out and dry off in their final moult. Some form rafts across the surface with aerial roots trailing into the water and leaves/flowers shading the surface, so they do several jobs in one.

To get any of these established, I think you will need to get creative with fencing them in from the ducks. I'm no expert on this but advice seems to be that a 50cm high barrier would do the trick - they can't hop over something that high and don't do precision-landings, so little pockets of fenced areas should work. I thought about your idea of creating barriers of floating straw like a boom across some areas, but I think the ducks would just walk over it! I think I would use that green square mesh you get in rolls for climbing plants and anchor it on the banking with tent pegs to make a series of semi-circular corrals. It should hold rigid enough to keep its shape. If this is too unsightly for such a public pond, then maybe hanging baskets or similar could be adapted?

Plants can be either sunk straight in to the banking or suspended in hessian grow bags if access is difficult - over time the hessian will biodegrade but the roots should have anchored the plant to the banking by then.

There are hundreds of plants to choose from, but I would choose maybe 10 varieties that you want to establish and plant clumps of 6+ of each type to give them the best chance of establishing. I have attached my wildlife sheets to give you ideas of plants to attract particular species, but if that is all a bit overwhelming, I'll list my favourites:

particular species, but if that is all a bit overwhelming, I'll list my favourites.

Caltha palustris - Marsh Marigold
Carex panicea - Carnation Sedge
Carex riparia - Greater Pond Sedge
Glyceria maxima - Reed Sweet Grass
Iris pseudacorus - Yellow Flag Iris
Lychnis flos-cuculi - Ragged Robin
Lysimachia nummularia - Creeping Jenny
Lythrum salicaria - Purple Loosestrife
Mentha pelugium - Pennyroyal
Menyanthes trifoliata - Bogbean
Myosotis palustris - Water Forget-me-not
Preslia cervina - Water Spearmint
Ranunculus flammula - Lesser Spearwort
Veronica beccabunga - Brooklime

The Yellow Flag Iris is the only native iris, but there are several smaller varieties that might be less likely to take over the pond if you weren't being purist with only having native plants? There is a strong argument for having some non-native plants as these often flower outside of our native flowering season and can provide nectar/pollen at times of the year when many of our native plants are dormant but our pollinators are active/hungry! The trick is of course not to introduce *invasive* non-native plants that would out-compete our native plants.

We supply all of the above at the shop, starting in late March, weather-permitting. They are all on the same mix-and-match price deal: £5 each or 6 for £25. We can deliver as you are only local, or you can collect from us at the shop. Ideally give us a couple of weeks warning if you want to order plants so we can get them in for you in the right quantities, otherwise just come and pick from stock if you prefer.

Plants to avoid:

While they are lovely and normally would be on my favourites-list, avoid the Frogbit (slow-growing and delicate - duck food!) and Water Crowfoot (prefers flowing water and doesn't do well in still water).

Longer-term algae solution - BARLEY STRAW

As I mentioned on Monday, this is a natural algae-inhibitor: bacteria and fungus break it down after about 3 weeks, and hydrogen peroxide is released for roughly 3 months, which inhibits algae growth. The recommended dose is 25-50g of barley straw per square meter of surface area. I think a standard bale from a farmer is 18-20Kg, and costs about £10 (although maybe you have a tame farmer in the village? If so, make sure the straw hasn't been sprayed with chemicals/pesticides etc).

To portion them out, the more of the surface exposed to the water and kept near the surface for maximum oxygen contact, the better they will work. If you're doing a homespun DIY project, you can either put them in black reusable mesh bags that come with a zip (which would blend in nicely) or bright orange onion sacks (cheaper but very orange!). We can supply the empty bags/sacks if needed, see table below for prices.

500g of straw treats 10m² (roughly a circular area 3.5m diameter) so using the 500g zip lock bags you'd need to space them 3.5m apart through the whole pond. The onion sacks treat 20m² so

you'd need to space them 3.5m apart through the whole pond. The onion sacks treat 20m² so you'd need them spaced roughly 5m apart. We'd need to measure the surface area to work out exactly how much to use, but to give you an idea:

Black Mesh Bags	25cm x 30cm	Hold 500g straw each, treating 10m ²	£2 each	500g portions should be spread 3.5m apart
Orange Onion Sacks	55cm x 50cm	Hold 1Kg straw each, treating 20m ²	£1 each.	1Kg portions - should be spread 5m apart

To anchor them you can attach them to weights and add a buoyancy aid to each pod (ask the villagers to stockpile their wine bottle corks for you!) to make them bob just below the surface like mines/underwater balloons, or tether them to the banks.

Just from an aesthetic angle, it might be better to do a greater number of the black mesh bags (maybe one every couple of meters) and have them tucked in amongst the marginal plant borders, and avoid having them visible in the open areas.

If all that is too messy/complicated, there is a liquid barley straw extract that works much more quickly - a 1 litre bottle treats 18,000 litres and costs £29.99. This is totally safe for all pets and wildlife, and you'd need to try to distribute it across the whole surface area - dig out your Super-Soaker!

Let me know if you have any questions or would like to order any of the above plants. We're placing our first plant order of the season this weekend, so could have them in for next Friday for you if you're ready that soon.

Lastly, if you're happy with all of the above, please let me know who I should make out the invoice for my visit to and I will get one organised.

Best regards,

Alison

harrogate aquatic 
AQUARIUM & POND SPECIALISTS

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