

Constructing ponds



A 50-YEAR PROJECT TO CREATE A NETWORK OF CLEAN WATER PONDS FOR FRESHWATER WILDLIFE

Pond construction can be as simple as digging a hole in the ground, but in most cases there are practical issues that require consideration, and often regulations to follow. Understanding these issues can make a pond creation project easier, safer, and more successful.

1. Managing the phases of construction

Starting work on site

Before excavation work starts on site, mark out important areas such as the pond outlines, where heavy machinery can move about, where spoil should be placed, or out-of-bounds areas. Use coloured sprays, stakes, fence posts with rope or hazard tape, or orange safety net fencing to outline areas. Ensure the digger driver has appropriate site plans to work to, perhaps laminated so that they can be kept in the cab of the digger for easy referral.

Hold a site meeting for those involved to talk over the purpose of the project, health and safety issues, everyone's role, the decision making process, and any other key information about the site and project.

On the first day, spend time with the digger driver explaining what you want to achieve and why. Make sure they look out for (and alert you to) likely problems such as field drains which could pollute or drain the pond.

Stay on site with the driver for at least the first few hours of digging to ensure your ideas are understood and being implemented. In many cases contractors will be used to working on ditches or road-building schemes where straight lines and evenly sloping banks are required, and may not easily adapt to the irregular slopes and rough finish of a pond creation scheme (Figure 1).

Continuing work

If you're not always on site yourself, visit regularly during working hours to talk to the on-site staff, check everything is OK, and solve any problems right away. Time visits to coincide with critical points in the excavation. Swap mobile phone numbers with the digger driver so that you can be contacted if issues arise at other times. If it becomes evident that additional works are needed, discuss the time and budget implications and get the work priced first before agreeing to it.

What's in this factsheet?

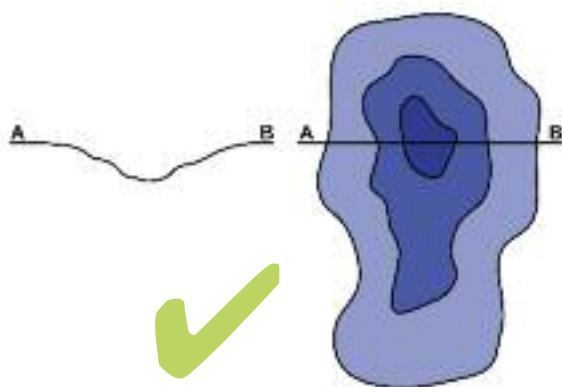
- Managing the phases of construction
- Choice of excavation techniques
- Pond liners
- Dealing with spoil and topsoil
- Responsibilities and constraints
- Documenting pond creation

Good communication with contractors is essential

A pond was dug by a digger driver with high level of expertise in using machinery to maintain water courses primarily for flood alleviation. The resulting pond was very neat and tidy, with a perfectly flat bottom and accurately angled batters (sides).

However the purpose of the pond creation project was to encourage a wide range of different pond plants and animals, which required a large drawdown zone and a lot of variation in pond depth. The whole project had been well-planned, but there was not enough communication with the digger driver about the pond design.

PROFILE AND PLAN OF PLANNED POND



PROFILE AND PLAN OF POND CREATED

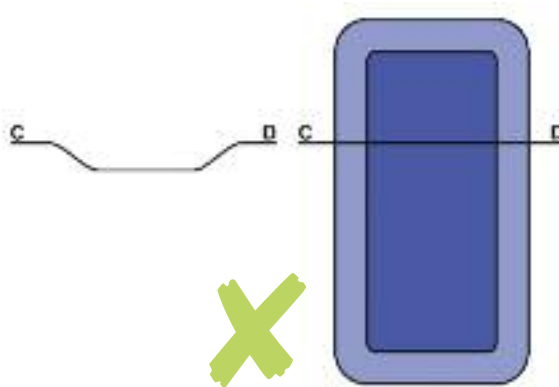


Figure 1. A pond as designed (left) and as implemented by a contractor with little expertise in digging wildlife ponds (right).

Completion of on-site works

Check that everything has been done to your satisfaction before signing off. This is easier if you are on site on a regular basis, able to address issues as they arise, and not just to see the end result.

The construction staff should leave the site in good order, but that doesn't necessarily mean perfectly neat. The rough surfaces left by toothed excavation buckets, mounds of dumped or spilled soil, scuffed turfs and wheel ruts can all add to the structural diversity of a site. Even at the micro-scale, such variations can improve the wildlife potential of wetlands.

It is important that key features such as paths and tracks, fences, gates and hedgerows are re-instated or returned to a satisfactory condition, and that all the conditions laid out in any licences or consents are met before signing off the work. If such works were specified in a contract, ensure the contractor has fulfilled all their obligations before they leave the site and payment is made.



2. Choice of excavation techniques

Small ponds with a volume of 1 – 2 cubic metres can be dug by hand by one or two people fairly easily especially where the spoil can be disposed of next to the pond. This can be a good task for a volunteer work party, and can be useful at sites with vulnerable habitats or species, or access issues. Larger ponds will normally require an excavator.

Large projects may also fall into the category of 'civil engineering project' or 'construction project', with implications for planning permission and health and safety requirements. Consultation with the local planning authority and examination of the Construction (Design and Management) (CDM) regulations will help you decide whether your project falls into these categories. For more information, see *Factsheet 6*.

Excavation machinery

Machinery can be hired on a daily or weekly rate, with or without a driver. If you are hiring a driver, bear in mind that, as experienced as the driver may be, they may not be experienced in creating ponds, and will require a detailed briefing on your project.

If you hire self-drive machinery, many companies ask for insurance to cover the value of the machinery whilst out on hire. The machinery needs to be insured by the person in control/custody of the machinery. You can buy a hire-in plant policy for the machine and time period you need. If you hire a driver with the machine, it remains under the control of the hire company and should therefore be covered by the hire company's insurance policy, leaving the responsibility for what happens to the machine in the hands of the hire company. Check this is the case before hiring any machinery.

Types of machinery



Mini-digger – these diggers range in size from 0.25 to 8 or 9 tons. They are useful for digging smaller ponds, trial pits and working under overhead obstacles, but they have a very limited reach and lifting capability. Although mini-diggers can be a cheap and attractive option, it is worth noting that larger machines are generally safer as they are more stable, harder to roll, and have fewer problems on soft ground because their weight is spread over a larger area.



Tracked excavator – these diggers can be anything from a few tons upwards, with a variety of different length arms. The cab and arm turn through 360 degrees, making them versatile and very efficient in excavating ponds and moving the spoil out of the way. They can also lift and move materials, such as rolls of pond liner. The tracks make them more stable on slopes or slippery ground than wheeled machines; rubber tracks cause less damage to hard surfaces than metal tracks.



Wheeled excavator – these machines, also known as 'rubber ducks', are less flexible for pond excavation than the tracked excavators. The wheels mean they can be unsteady, and get bogged down in soft ground.



Bulldozer – if they are already available on site, these can be used for creating very shallow scrapes, but are limited to a forward/backward movement to move spoil around. If spoil needs to be carried away from the pond, additional machinery will be needed.



Wheeled digger – this digger, also known as a ‘JCB’ or backhoe loader, is good for moving spoil around, but the limited forward/backward motion (the cab and arm don’t turn like the tracked excavator) makes them less efficient for pond excavation and detailed landscaping. The wheels mean they can be unsteady on soft ground.



Dumper – these mobile machines, available in a range of sizes, are useful for moving spoil around site. An excavator’s progress can be slowed down if it is waiting for a dumper to return, so larger dumpers are generally more efficient. Think about how long it will take for the dumper to make a round journey. Two dumpers that work in relay is often a good solution for longer journey times.



Telehandler – these fast, mobile machines are good for handling rolls of liner and other materials and running them around a site. Using a telehandler leaves the excavator free to dig whilst the telehandler runs materials across the site.

The size of excavating machinery and dumper trucks used can be important issues. Site access restrictions, such as narrow gateways, soft ground, valuable habitats, the space between or under trees, or overhead power lines, will influence the size of machine you choose. Delivery of the machine to site on a low loader could also be an issue – liaise closely with the hire company to identify suitable access points for delivery and collection of the machinery.

The types of bucket used on an excavator will have an impact on the rate of work, and the quality of the results.



Digging bucket – available with or without teeth, this is the best bucket for excavating ponds. The teeth are good for digging and breaking up the ground, and forming a rough surface in ponds that provides a varied micro-topography. Toothless buckets may be more suited to some soil types, especially when it is desirable to form a more compact surface on soils vulnerable to erosion or washing into the pond.

Dyking/dredging bucket – generally a very wide, shallow bucket. It is ideal for moving loose soil around, and dropping spoil back into ponds (necessary for some types of liner), or creating other landscape features.

Trenching bucket – available with or without teeth, this narrow bucket is good for digging narrow trenches for drains etc, but it less useful for excavating ponds.



Excavation methods

Depending on the size and location of the pond, soil types, ground water levels, and the machinery used, there are a variety of approaches to excavation and you should discuss the best strategy with the contractor.

Some ponds, particularly large ponds or sites with high groundwater levels, may start to fill with water during excavation. You will need to have a plan to deal with this, and discussions with the digger driver will be valuable.

If you know in advance that the site will fill rapidly (observed in test pits or other ponds), an appropriate pattern of excavation can be used from the start. For example start excavating the centre and gradually remove spoil as you work out towards the edge to avoid having to re-work deep areas that have filled with water (Figure 2). This is only suitable for sites where there is good access round the pond perimeter.

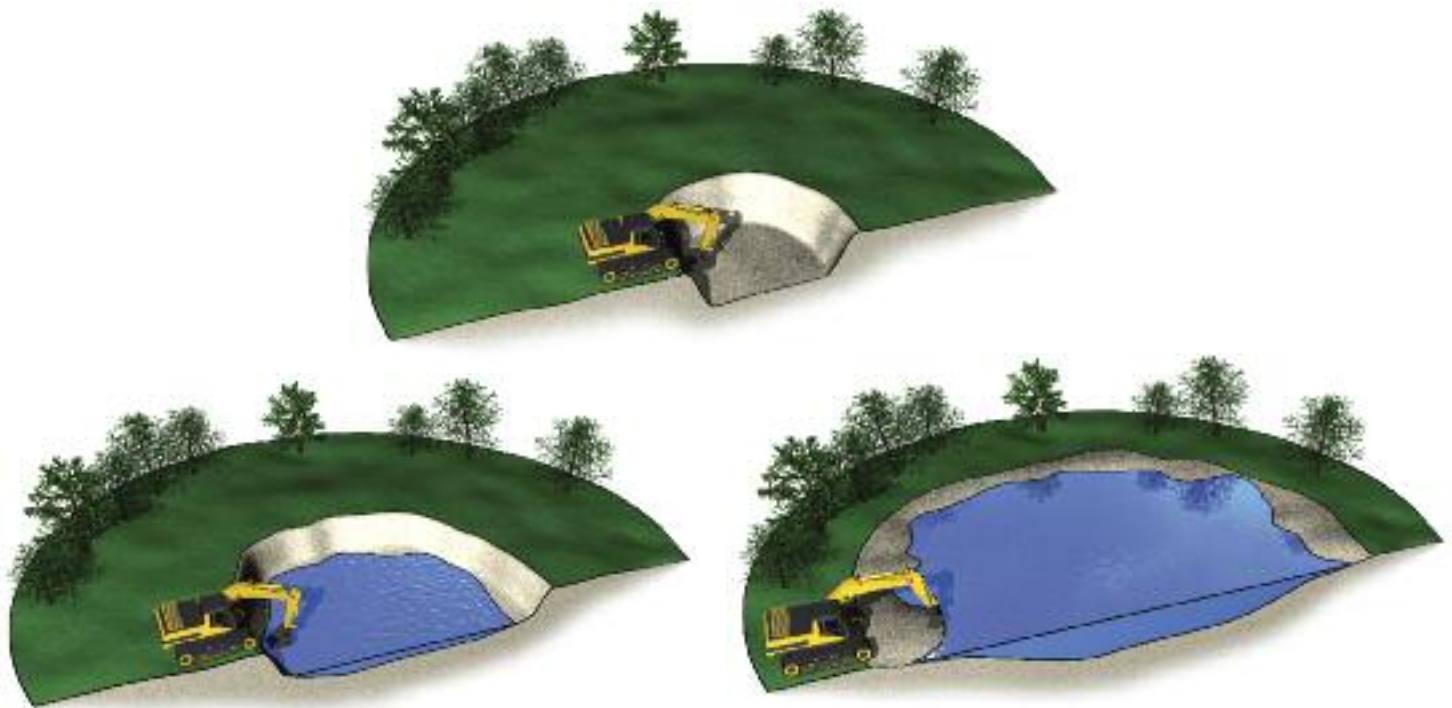


Figure 2. Working a pond from the centre outwards – good for ponds which fill quickly with water.

Water-pumps are sometimes necessary to help excavate ponds. They are usually required for deeper groundwater ponds or in cases where excavations have been left unfinished for some time. Pumps can take up to a few days to drain flooded sites, which can cause additional delay. Care needs to be taken so that terrestrial or aquatic habitats or other properties are not affected by the discharge water, particularly if this water is silty. The last dregs of water from a pond often contain particularly high levels of silt so switch off the pump before it sucks them up. Silty water may have to be pumped into a temporary lagoon, bunded area, settling tank or filter system before it is disposed of. Discharging water into streams, ditches or drains may require a discharge licence from the local authority or the Environment Agency.

Finishing-off the pond margins

Pond creation is not an exact science, and sometimes ponds don't turn out exactly as planned. Usually this is because water levels aren't exactly where predicted.

Bringing back a digger to the site for half a day a year after creation can fix most problems and brings additional benefits:

- Firstly, banks can be modified with the pond now full of water. Using water level as a guide, it's very quick and easy to create pools and hummocks in shallow water areas using a digger (Figure 3).
- Secondly, it's cost effective. The small amounts of excavated spoil (though not topsoil), can be re-used around the site to make hummocks, spits, islands, underwater bars or shallower slopes in the pond itself. See the Factsheet 4 for ideas.

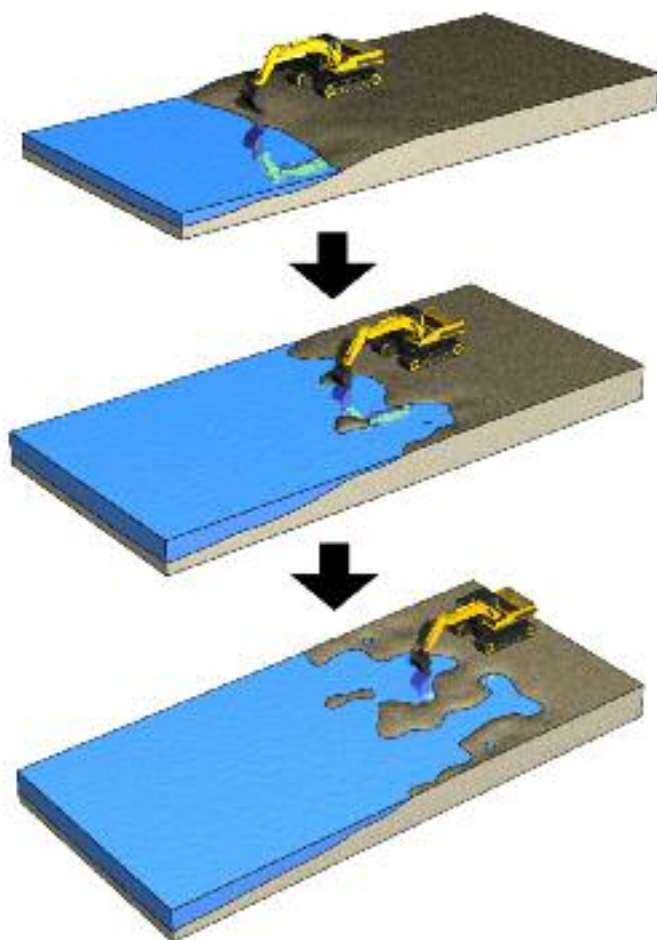


Figure 3. How to improve pond margins after creation. Digger driver works backwards from the waters edge, creating undulating edges and using the water as a natural 'level' to see the shapes made.



3. Pond liners

Pond liners are often not needed to create ponds. The rationale behind the Million Ponds Project is to put clean waterbodies back in the landscape, and the most sustainable and cost effective way of doing this is to make use of natural, clean water sources without the need for pond liners. Reliance on natural hydrology will mean that ponds will have natural fluctuations in water levels. Some may dry up in drier months but this is not a problem for wildlife. Temporary (seasonal) ponds, or ponds with large water level fluctuations, are important for a wide range of wildlife, and a much neglected habitat type.

Practically, though, pond liners do allow ponds to be created on sites where the natural hydrology or geology is unsuitable, or where there is good reason to keep the pond separate from the groundwater, e.g. where groundwater may be polluted such as on reclaimed landfill sites. There are, however, significant drawbacks to using liners: the ponds are more expensive to create, more prone to damage and sudden water loss and have little flexibility if you want to modify the pond at a later date.

Highly permeable and freely-draining soils are not ideal for pond creation, and can require lots of effort or resources to ensure water is retained, even with a liner. For example, the catchment of a lined pond in very permeable substrates like gravels or sands may be restricted to the area that is lined – other water drains straight into the ground. This could result in a pond that holds water only in periods of high rainfall, which can be an excellent wildlife habitat, but will disappoint anyone hoping to create a permanent water body. The catchment could be increased by extending the liner well beyond the pond margin, but it may be more appropriate to look for an alternative site to create a pond (Figure 4).

Information about the range of pond liners available and their merits is given on the *project website*.

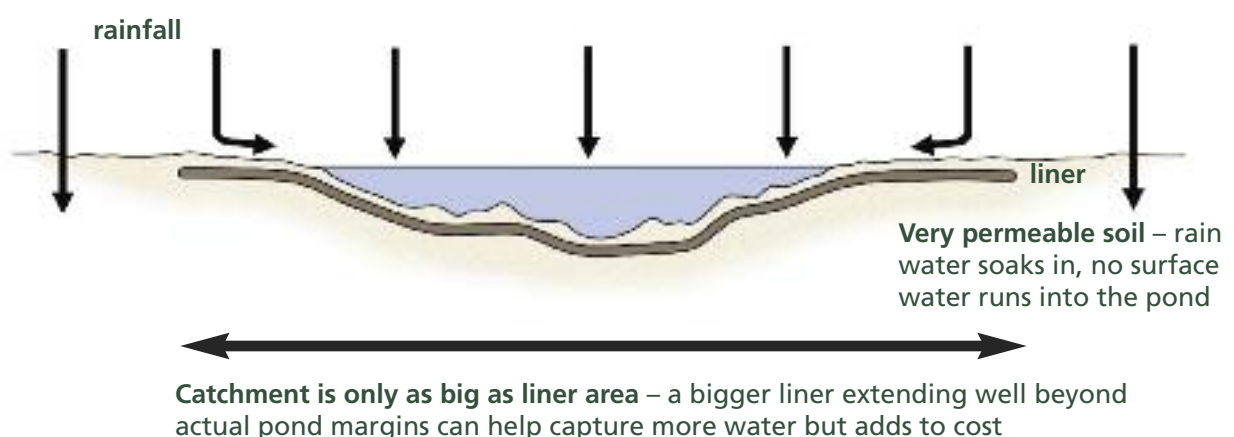


Figure 4. Use of a pond liner on a highly permeable soil.



4. Dealing with spoil and topsoil

It is easy to underestimate the volume and weight of spoil that pond excavation generates, and the amount of time it takes to handle it. So:

- Minimise time and costs by not moving spoil far from the pond wherever possible and using it to create beneficial features.
- Have a sufficient number of suitable vehicles to transport the spoil.
- Ensure the machines use the designated routes identified during the planning stage to transport spoil to minimise any impact to sensitive areas.

Always bear in mind the impact dumped spoil could have on terrestrial and aquatic habitats, and on the success of the ponds being created. For example, do not build a rim or bank around the pond which could interfere with the passage of good quality surface water into the pond, don't use spoil to fill in hollows or depressions which could be of ecological value, and don't spread spoil in areas where it can be washed into ponds or other water bodies.

Topsoil is the dark organic rich soil at the surface, usually it forms a layer somewhere between 5 and 20 cm deep. Topsoil is often added around pond margins to add fertility, but this pollutes pond water, and should be avoided in all areas either in or around the pond, or on its upper banks.

To avoid any enrichment problems, scrape off topsoil from around the pond, and don't store or dispose of topsoil in any areas where it can be washed into the pond or other waterbody. Temporary bunds can be used to contain any run-off from temporary storage piles of spoil or topsoil.

There are more details of dealing with spoil in *Factsheet 6*.

5. Working within responsibilities and constraints

The main issues associated with pond creation should have been foreseen and allowed for during the planning phase of a pond project. The main tasks during construction are to ensure that any necessary licences or consents have been obtained before work starts on site, and that the agreed work plans are followed. If legal requirements are not met, anyone involved in the work may be liable to prosecution.



Some potential constraints

Please read *Factsheet 6* for additional information about taking into consideration these constraints at the planning stage.

- **Designated sites** – some sites (e.g. Sites of Special Scientific Interest and Special Areas of Conservation) are legally protected against a range of harmful operations either on site or on nearby land. Natural England www.naturalengland.org.uk or the Countryside Council for Wales www.ccw.gov.uk should be consulted well in advance, and any consents obtained before work commences. The agreed work plan should be adhered to; if plans are changed, new consents may be required.
- **Tree felling or pruning** – if the project involves tree work, a felling licence may be required from the Forestry Commission. There are several exemptions from licensing. Check with the Forestry Commission if you think the work is exempt from licensing. Find out more on the Forestry Commission website at www.forestry.gov.uk. The local authority should be consulted over trees covered by Tree Preservation Orders or by conservation area designations.
- **Planning permission** – if planning permission has been granted, ensure that the conditions are met, including timing of works and size of excavations. There are implications if the plans are not stuck to, including orders to re-do or un-do any inappropriate or poor quality works at your own expense. If you want to modify plans, consult a planning officer and, if necessary, apply for a modification to planning consent.
- **Health and safety** – the potential risks to health and safety should be identified and assessed in advance, and the necessary precautions, such as fencing off hazardous areas or provision of personal protective equipment, put in place. During construction, look out for new hazards and update the risk assessment as necessary and record and communicate any changes to all who need to know. If the project falls under the CDM Regulations, ensure all the responsibilities are met.
- **Protected species** – licences should be obtained in advance for any work that affects protected species from Natural England or the Countryside Council for Wales. Work carried out without a licence, including site preparation work such as cutting long grass, may be unlawful and result in prosecution. If you want to modify plans, get expert advice and apply for new licences if necessary. If protected species are discovered during construction, work should be suspended immediately and advice sought. It may be necessary to change your plans and obtain a licence.
- **Work in a floodplain** – work within floodplains is likely to require written consent from the Environment Agency. This should be in place before work begins on site. Again, if you want to modify plans, discuss it with an Environment Agency officer and get written consent if required.
- **Services** – ensure plans are in places to avoid or deal with the power lines, drains, gas pipes etc that have been identified on site, but be prepared for the discovery of other pipes or cables, or accidental damage to services. Have all the relevant phone numbers and emergency contact details to hand on site, and if unsure about anything, halt work and get expert advice.



6. Documenting pond construction

It is good practice to keep a record of how ponds were constructed (see box) – this can be very beneficial for the future management of the site, dealing with problems or failures, and helping others undertaking similar projects. Such documentation will also be useful in the unlikely event that regulatory authorities (e.g. local planning authority) question an aspect of the project.

Photographs and annotated plans are an excellent way of documenting the site before, during and after the pond construction work.

Documenting pond construction

Keep a record of the your pond creation project, including:

- the type of materials used
- where materials were sourced
- costs and sources of funding
- timing and time taken for pond creation
- manpower required
- site information
- licences and consents
- surveys and assessments
- plans of drains and utilities
- soil types and hydrology
- Photographs (before construction, during construction and after construction)

When you've created your ponds, contribute to the Million Ponds Project targets: tell us about the clean water ponds you've created on the project website.

For further information about the Million Ponds Project please visit www.freshwaterhabitats.org.uk/projects/million-ponds or email enquiries to info@freshwaterhabitats.org.uk