Some Considerations for Designing your Hare's Corner Pond

When designing your pond layout there are a number of factors that may be helpful to consider, summarised as follows:

Intended use	Location
Size and shape	Bank slope
Depth	Water source
Lining requirements	Planning permission and liaison with official bodies
Plants and planting	Ecological impact

A summary of the construction process is included at the end of this document, along with sketches of different pond layout options for different sites.

1. Intended use

The intended use of the pond will be an important factor in determining the size, depth and location. Potential uses may include wildlife benefit, habitat enhancement, nutrient and/or sediment removal, or amenity use, irrigation water storage or an attractive water feature within the landscape.

If you want a gravity-fed irrigation source for your farm or garden, then keeping the pond elevation as high as possible will be important. For a wildlife pond, any size, shape or layout will be beneficial, but generally shallow bank slopes, undulating margins and an island may be useful factors to consider. For wildlife ponds, the greater the area of any protected space, the greater the number of species that will thrive there. Also a diversity of habitats will support a greater number of species; such as deep areas, shallow margins, a wetland marsh fringe, an island, some wet grassland etc.

2. Location

The location of your pond will depend on a number of important factors. These will include the site topography, the water source, the liner type required (if any), personal preferences based on the layout of your garden or farm, and the required use of the pond. Consider these factors when assessing the most suitable pond location.

A tool used in Permaculture designs is to build an irrigation pond on the key-point of the land (see fig. 5). This is the point at which the elevation is still high in the farm, but where excavation of a pond will still give a generous volume of water for storage. For more on the use of farm ponds for irrigation see https://permacultureapprentice.com/permaculture-water-management/

3. Size and Shape

The size will depend on the intended use, availability of space, budget, and the type of water source on site. Wildlife ponds large enough to have an island and a mosaic of habitat types around it will support more species than a tiny garden pond – but any size will provide valuable habitat nonetheless. If you have high groundwater or a supply of clean spring water from a farm drain and heavy clayey soils for lining, then you can make a large pond at lower cost and easier construction than if you are on gravelly free draining soils or karst limestone.

Vis a vis shape: for wildlife ponds, having an island is useful, and having scalloped edges is also helpful to maximise the shoreline length. For silt trap ponds, maximise the distance between the inlet point and the outlet point to enhance the capacity for settlement across the pond base. For water storage ponds the shape may be less important than volume, but consider benefiting wildlife at the same time by maximising edge length and making the edge slope very shallow.

4. Bank slope

A shallow bank slope will generally provide greater wildlife benefit, broadening this important edge

habitat and also making it easier for insects, birds and frogs to enter and exit. That said, the steeper the bank slope, the greater the area of open water and total storage volume of the pond per unit area of the total project.

If space is limited and you want to combine good storage volumes (for irrigation ponds) and a shallow edge for wildlife, then consider deepening the pond only towards the centre. Thus have a shallow perimeter edge of between 1:5 and 1:20 for the first few metres around the edge, deepening more steeply (1:2 to 1:3) to your final pond depth in the centre.

5. Depth
While depths of up to 30cm are generally the most valuable for wildlife benefit, deep water is useful for irrigation water storage and for those species that prefer deeper water. It's also useful for maintaining some open water if levels fluctuate widely throughout the year. If your pond is designed as a silt trap, then a water depth of 1m will provide greater settlement than a shallow pond, and will require less frequent maintenance to remove accumulated silt. For more detail on pond depths see factsheet 4: https://freshwaterhabitats.org.uk/projects/million-ponds/

6. Water source
Water sources may include roof runoff, field runoff, farm drains or streams, groundwater or rainfall. The reliability of the water source will influence the liner type selected. If you are relying on rainfall, then an artificial liner will almost certainly be necessary. On heavy soils such as marl or peat, modest inputs from a roof or clean yard may well suffice (after a small filter marsh area to screen out fines and leaf litter etc.). Where groundwater is high, no liner may be needed, but levels may fluctuate seasonally and require consideration at the design stage.

7. Lining requirements
The best and most cost effective liner is impermeable underlying subsoil such as marly clay or peat. Where an artificial liner is needed in order to hold water, a number of options such as EPDM (butyl), polyethylene or geo-synthetic liners may be used. Depending on the desired use for the pond and the reliability of the water source, several layers of silage pit cover plastic may make a suitable pond liner at very little cost. If using a plastic liner, ensure that there is a gradual slope up from the base to the outer edge, so that air cannot become trapped beneath the liner and float it.

From a wildlife perspective, it's generally considered better to use existing subsoil as the liner, even if it means allowing the pond to dry out seasonally, rather than to import a synthetic liner into the site. For more detail on pond liners see factsheet 7:
https://freshwaterhabitats.org.uk/projects/million-ponds/

Liner costs vary widely with grade and durability. Several layers of silage pit cover plastic will cost under €1/m^2; polytunnel plastic *c.*€4/m^2; more durable EPDM liners c.€13/m^2. The selection will depend on the degree to which you will tolerate small punctures, the potential for topping up water levels (such as direct from house or shed gutters), and the degree to which you want clear open water. This is more of an aesthetic consideration than anything, since wildlife will value seasonal ponds as well as permanent ones. Note that most liners will benefit from several sheets of old silage pit cover plastic or other suitable protective sheet above and below the main impermeable liner.

8. Plants and planting
For an amenity pond such as a garden pond or swimming pond, you may wish to plant some tall species which will look well from the outset; such as yellow flag (*Iris pseudacorus*) or bulrush (*Typha latifolia*). Note that many marsh plants are very vigorous and will take over shallow ponds if left to grow unchecked. For silt trap ponds, early planting with tall wetland plants will be useful to help slow the flow of water and enhance settlement of silt and debris in the water.

For wildlife benefit it may be quite appropriate to simply let your pond colonise naturally with plants. Another option is to bring in a handful of sediment from a nearby drain, pond or stream on the land to bring in seeds and insects. The One Million Ponds project (factsheet 8) specifically recommends against introducing plants; instead allowing them to colonise naturally over time, providing a bare soil habitat in the meantime, which is useful for early colonising species.

9. Planning permission and Liaison with official bodies

Planning permission is not needed for a pond as long as the change in ground level is less than 3 feet. Specifically, S.I. No. 236/1964 - Local Government (Planning and Development) Act, 1963 (Exempted Development) Regulations, 1964, states that "The construction of any path, drain or pond or the carrying out of any landscaping works within the curtilage of a dwellinghouse" is classed as exempted development, on condition that "The level of the ground shall not be altered by more than 3 feet above or below the level on the appointed day."

If you are working within an existing stream, then liaison with Inland Fisheries Ireland will be required. If working within an SAC (Special Area of Conservation), liaison with NPWS (National Parks and Wildlife Service) will be needed. In some areas other public bodies may also have a role to play in assessing the proposed works (OPW where weirs are being considered on a watercourse; ESB where power-lines or access to same may be impacted in any way, etc.).

Working within existing streams and protected areas is generally discouraged and permission to do so may not be granted, or granted subject to extensive conditions. Avoid working in existing streams and protected areas unless there is a good reason otherwise, and then only after obtaining approval from the appropriate body.

10. Ecological impact

Your pond should be net beneficial for local wildlife. As such it is important to ensure that you're not building it within a protected area or existing vulnerable or protected habitat. For more detail on protecting existing habitats see factsheet 6: https://freshwaterhabitats.org.uk/projects/million-ponds/

Summary of the Construction Process

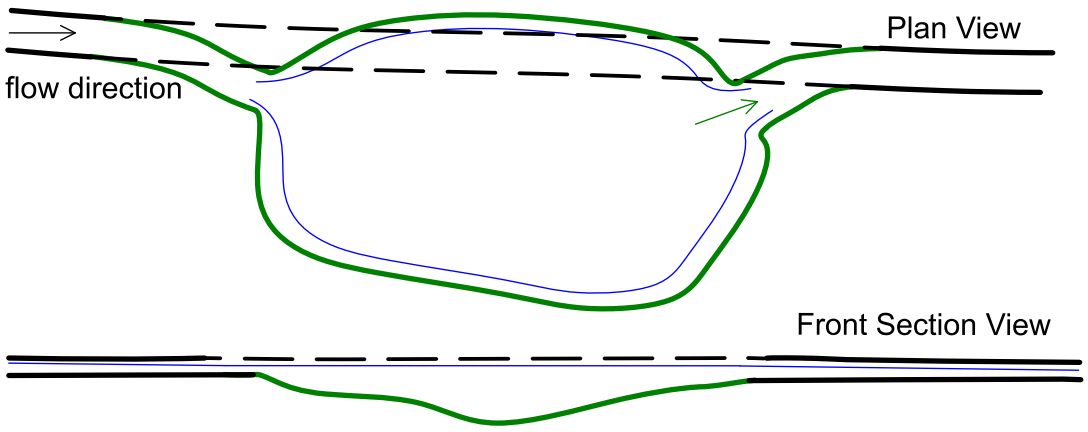
1. Select your location and design your pond layout, shape and depth.
2. Remove the topsoil and use elsewhere in the garden or farm.
3. Remove topsoil from the perimeter embankment on the lower side, if a lower retaining dam is to be used.
4. Excavate the subsoil to the required depth, building perimeter embankments on the lower side if a dam is needed, or throughout the pond margin as a way to dispose of excess subsoil into the project area (while avoiding blocking inflow of surface runoff water if that is needed as a water source).
5. If the subsoil is relatively impermeable, compact the base well with the excavator. Alternatively assess the need for a liner and use one if required; covering with 200-300mm of soil to protect it from damage.
6. In a clay lined pond, compact any retaining dams well in rises of 15cm to get a good solid earthen mound with a good seal.
7. Create shallow gradients or a stone splash-deck at the inlet and outlet points (if present) to prevent erosion.
8. Replace loose subsoil or topsoil on the pond edge and perimeter for plant establishment.
9. Plant with selected plant species if required, or allow to establish naturally.
10. Fence from livestock or children where needed.

Some Pond Layout Options - *attached*

Attached are some layout options which may offer suggestions as to your own pond design based on your own landscape topography and water table levels etc.

Pond creation in a widened drain (no plastic liner)

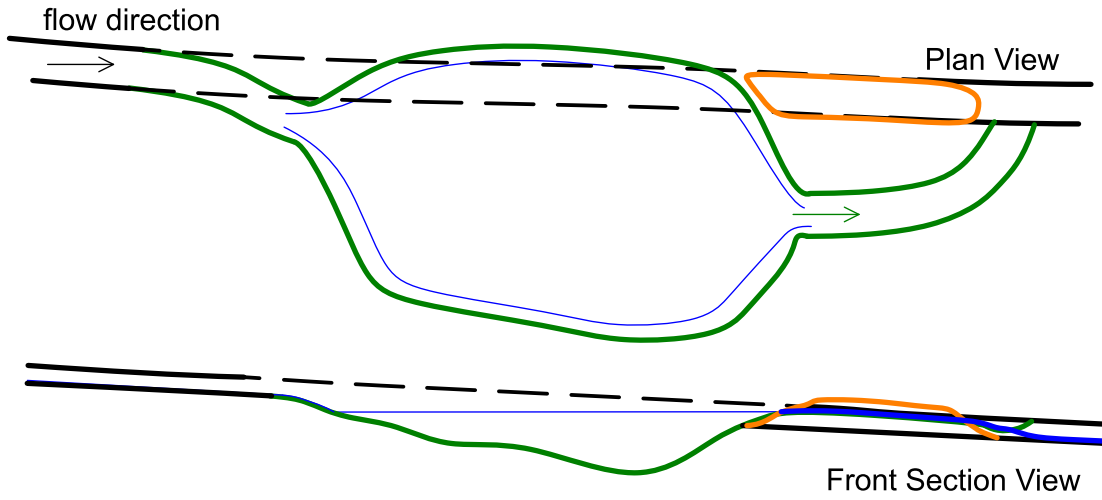
Pond in level drain, high water table



1 - clear topsoil and vegetation and remove to build up soil elsewhere in field
2 - remove subsoil to required depth
3 - reroute inlet and outlet streams to lengthen flowpath for enhanced silt settlement
4 - soften edges to create shallow slope for wildlife and safety (<1:3)

Pond will fill naturally with high water table.
Seasonal drying may occur. This is still ok for wildlife.
For more open water dig broader pond.

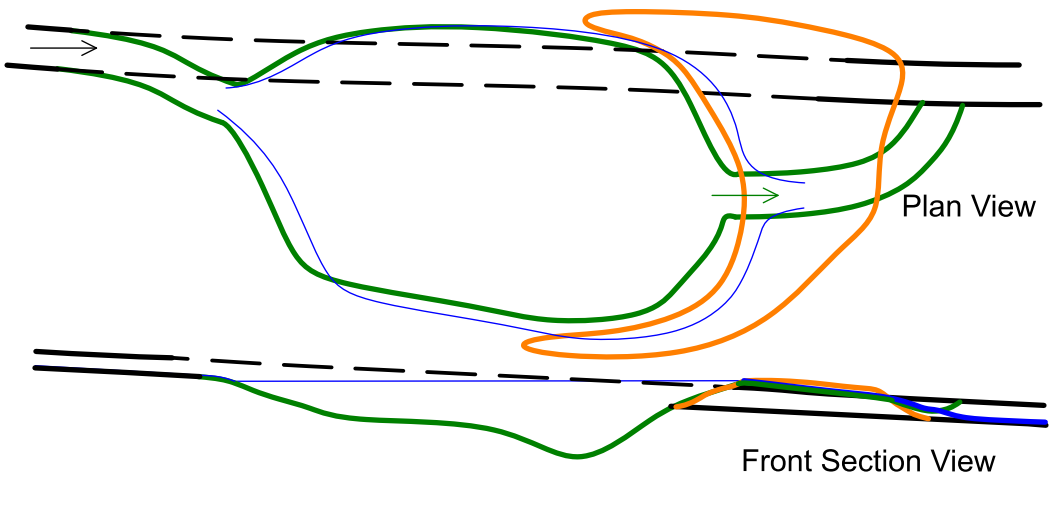
Pond in sloping drain, clay/peat subsoils



1 - clear topsoil and vegetation and remove to field or garden.
2 - remove subsoil to required depth across pond.
3 - build clay bund within the channel, compacted well onto a bare clay base (having removed vegetation to avoid leakage later)
4 - well compacted bund to be higher than surrounding ground to avoid erosion of fresh earth
5 - soften edges to create shallow slope for wildlife and safety (<1:3)

Pond will fill from inflow.
Seasonal drying may occur if drain runs dry in summer. This is still ok for wildlife. For more open water dig broader pond or build perimeter embankment. In all drain damming works be mindful to avoid flooding neighbouring lands.

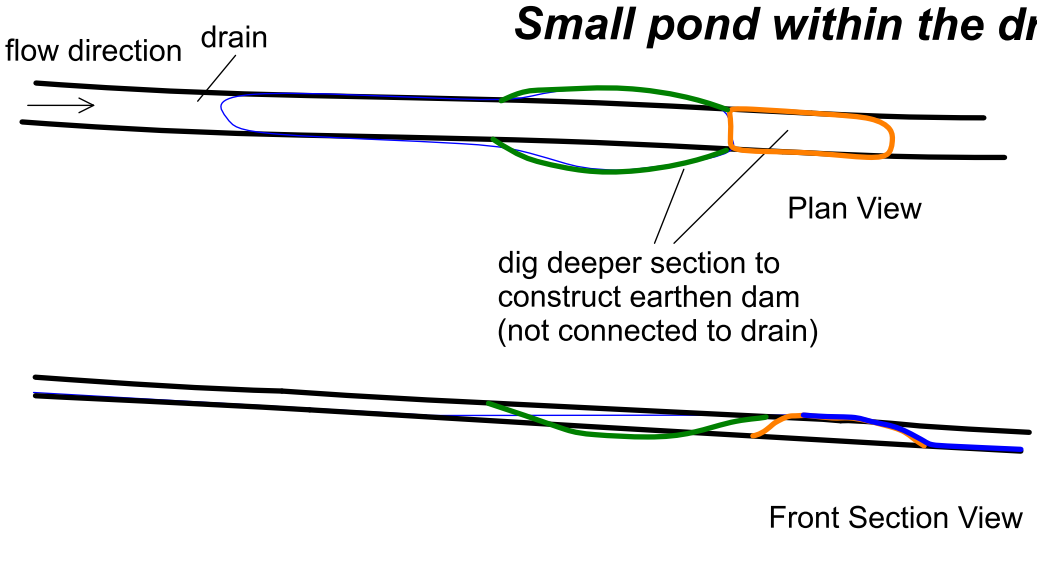
Pond in sloping drain, clay/peat subsoils, increasing depth by building a higher dam



1 - clear topsoil and vegetation from pond base and perimeter embankment base and remove to field or garden.
2 - remove subsoil to required depth across pond.
3 - build clay bund within the channel, compacted well onto a bare clay base (having removed vegetation to avoid leakage later)
4 - build clay bund around lower pond perimeter, compact well
5 - create slight depression (15cm) at selected location as spill-over location for new water exit point and route in a long shallow flow-path back into the main channel
6 - perimeter bund to be higher than surrounding ground to avoid erosion of fresh earth, except at spill-over location; to be covered with grassed sod for protection from erosion
7 - soften pond edges to create shallow slope for wildlife and safety (<1:3)

Pond will fill from inflow.
Seasonal drying may occur if drain runs dry in summer. This is still ok for wildlife. For more open water dig broader pond or raise perimeter embankment. In all drain damming works be mindful to avoid flooding neighbouring lands.

Small pond within the drainage channel



1 - clear topsoil and vegetation from areas being worked on (both bund and wider section) and remove to field or garden
2 - excavate subsoil from drain edge above bund
3 - build clay bund within the channel, compacted well onto a bare clay base (having removed vegetation to avoid leakage later)
4 - create slight depression (15cm) along the centre of the clay bund for raised water exit point and cover with grassed sod for protection from erosion
5 - soften pond edges to create shallow slope for wildlife and safety (<1:3)

Pond will fill from inflow.
Seasonal drying may occur if drain runs dry in summer. This is still ok for wildlife. For more open water dig broader pond.
In all drain damming works be mindful to avoid flooding neighbouring lands.For steep sided channels a much larger dam can be made for a larger pond.

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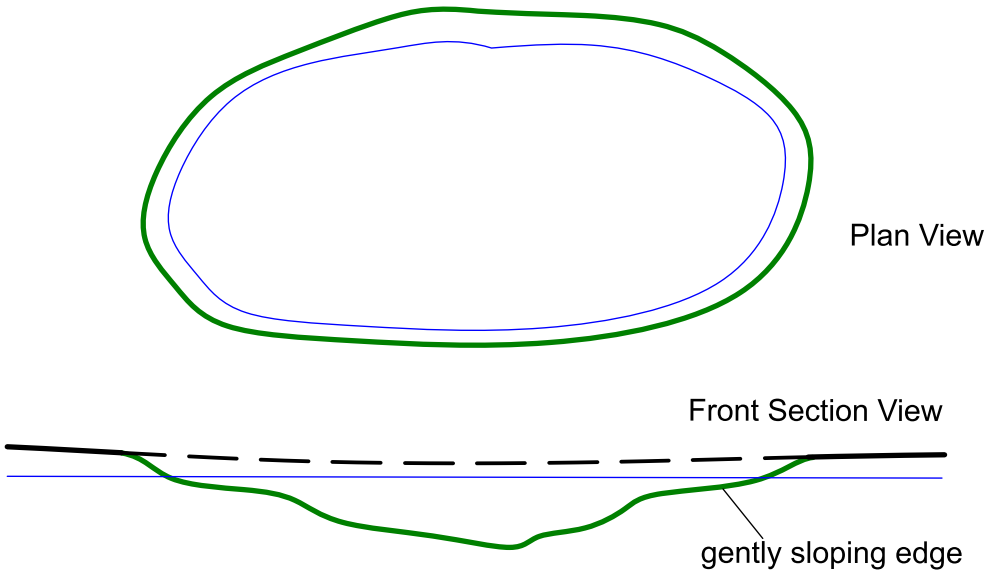
Pond creation on level site with high water table (no plastic liner, soil removed from pond area)

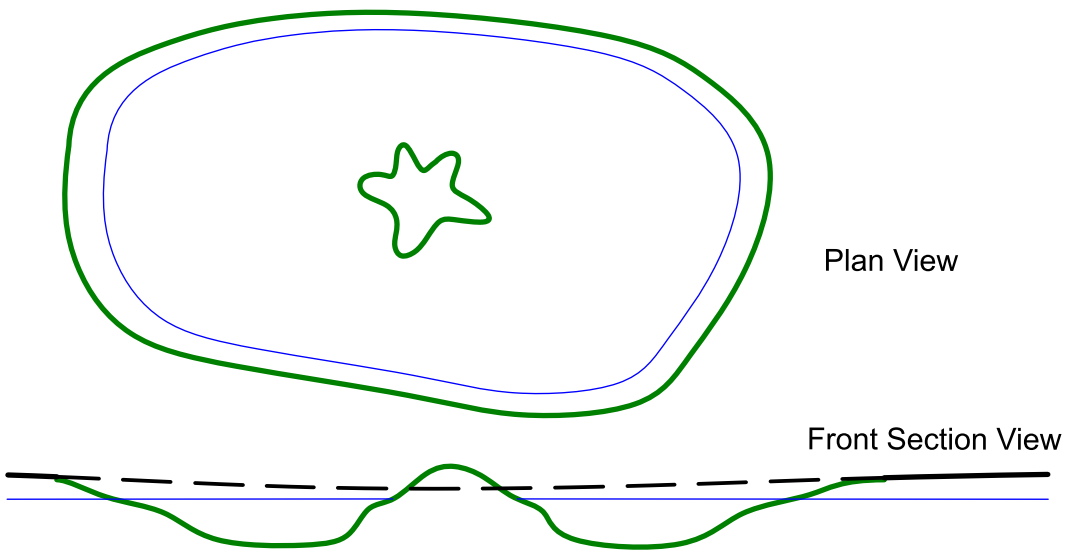
Pond on level ground with high water table



1 - clear topsoil and vegetation and remove to build up soil elsewhere in field or garden
2 - remove subsoil to required depth, being mindful of summer and winter groundwater levels when planning excavation depths
3 - soften edges to create shallow slope for wildlife and safety (<1:3)

Pond will fill naturally with high water table.
Seasonal drying may occur. This is still ok for wildlife.
For more open water dig broader and/or deeper pond.

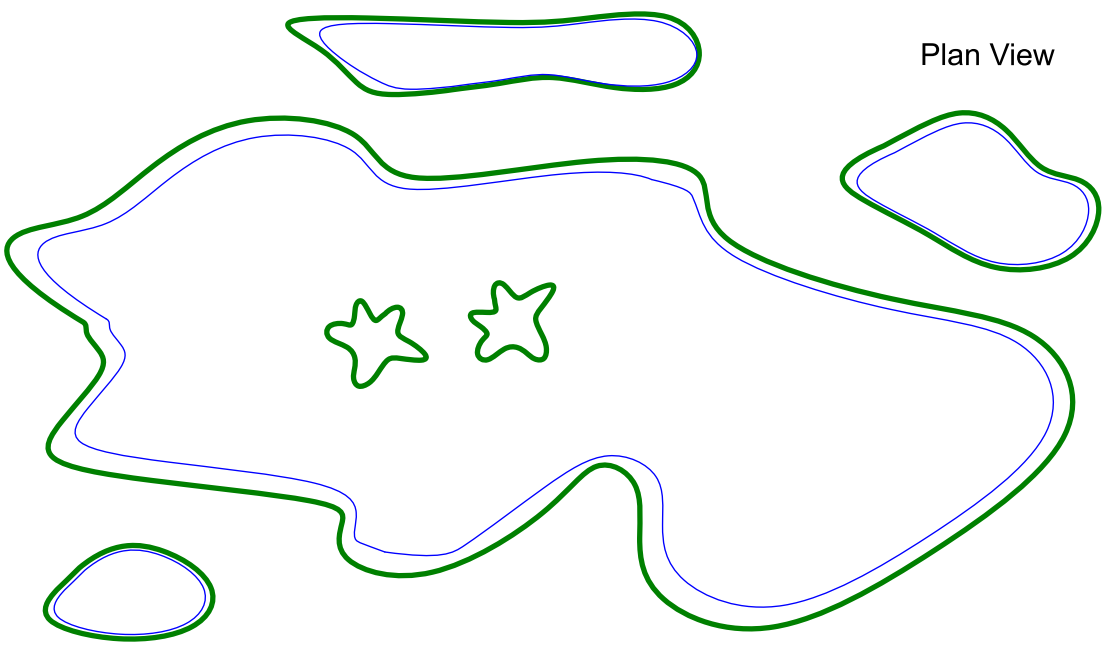
Pond on level ground with high water table, showing island in centre



1 - clear topsoil and vegetation and remove to build up soil elsewhere in field or garden
2 - remove subsoil to required depth, being mindful of summer and winter groundwater levels when planning excavation depths
3 - leave or mound up island for wildlife interest and to use some of the excavated soil
4 - soften edges to create shallow slope for wildlife and safety (<1:3)

Pond will fill naturally with high water table.
Seasonal drying may occur. This is still ok for wildlife.
For more open water dig broader and/or deeper pond.
Star shaped islands offer greater edge habitat and shelter for birdlife.

Level ground, high water table: Pond/wetland mosaic to maximise habitat value



1 - clear topsoil and vegetation and remove to build up soil elsewhere in field or garden or build up as mounds or islands
2 - remove subsoil to required depth, being mindful of summer and winter groundwater levels when planning excavation depths
3 - leave or mound up island for wildlife interest and to use some of the excavated soil
4 - soften edges to create shallow slope for wildlife and safety (<1:3)

Pond will fill naturally with high water table.
Seasonal drying may occur. This is still ok for wildlife.
For more open water dig broader and/or deeper ponds.
Mosaic of ponds provide a broader range of habitat types for wildlife. Star shaped islands offer greater edge habitat and shelter for birdlife.

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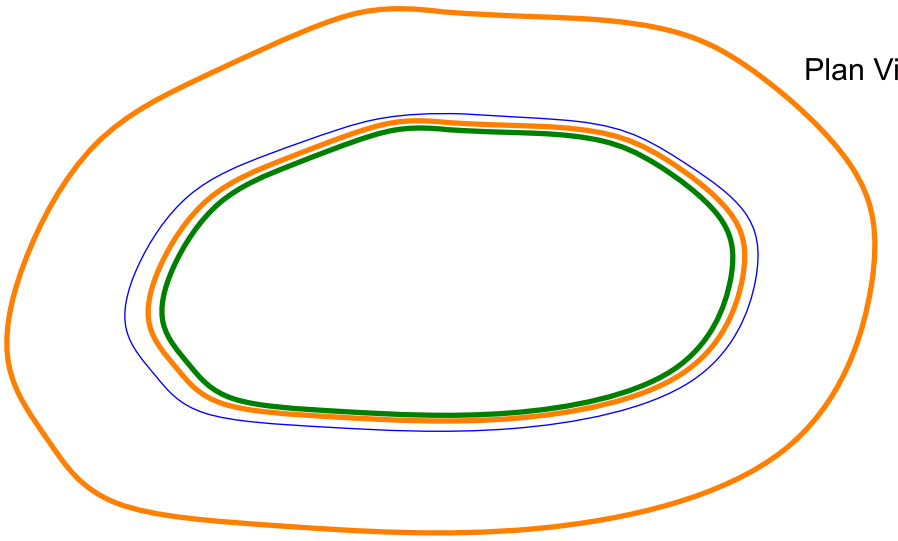
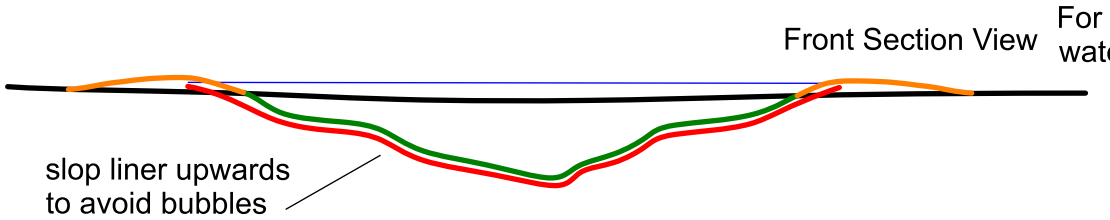
Pond creation using liners

Slightly raised pond using perimeter edge to hide excavated soil

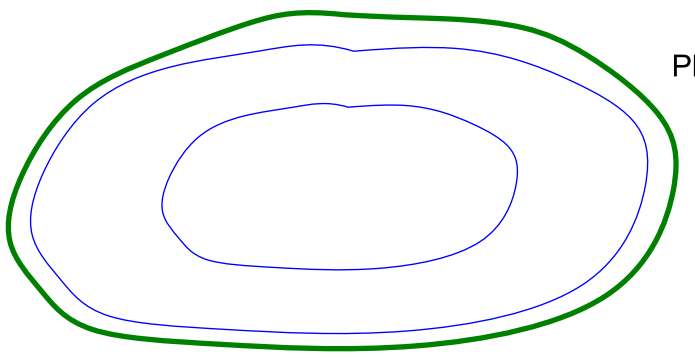


1 - clear topsoil and vegetation from pond and perimter bund area and remove to build up soil elsewhere in field or garden
2 - remove subsoil to required depth, moving subsoil to the pond perimeter to build up a raised edge
3 - set some soil to one side for use on top of liner
4 - ensure that edges are gently sloping for wildlife and safety (<1:3)
5 - lay liner across pond base, keeping a lot of slack to avoid puncuture when soil is replaced
6 - ensure that the upper liner perimeter is level all around
7 - replace soil to a depth of 15cm across full liner or across liner edge if pond is too braod to do the work to do the work without tracking onto the lined area

Pond will fill from rainfall only and possibly from upslope runoff.
For water sources other than direct rainfall consider shed or house roof water or piped inputs from upgradient stream or drain.

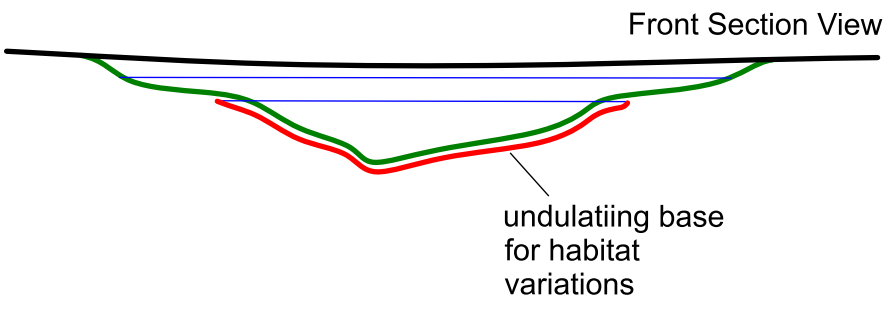


Pond in medium draining soils with reduced plastic sheet for permanent pond in the lower section and seasonal flooding in winter

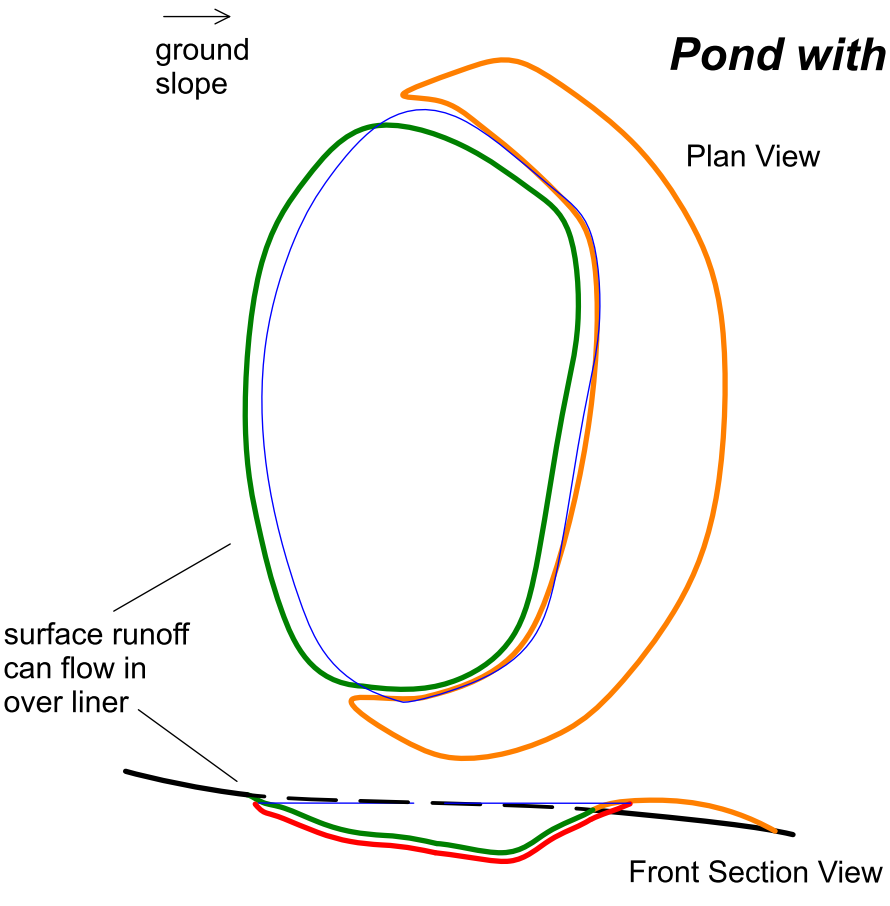


1 - clear topsoil and vegetation from pond and perimter bund area and remove to build up soil elsewhere in field or garden
2 - remove subsoil to required depth for use elsewhere also
3 - set some soil to one side for use on top of liner
4 - ensure that edges are gently sloping for wildlife and safety (<1:3)
5 - lay liner across pond base (either high around the edge for a larger permanent pool or for a seasonal variation in water on heavy soils lay a liner just in the lower section for permanent water cover, but allowing water to fall and rise in the upper section as a marsh/bog garden
6 - keep a lot of slack to avoid puncuture when soil is replaced. Ensure that the upper liner perimeter is level all around
7 - replace soil to a depth of 15cm across full liner or across liner edge if pond is too braod to do the work to do the work without tracking onto the lined area

Pond will fill from rainfall only and possibly from upslope runoff.
For water sources other than direct rainfall consider shed or house roof water or piped inputs from upgradient stream or drain.



Pond with liner on sloping ground



1 - clear topsoil and vegetation from pond base and perimeter embankment base and remove to field or garden.
2 - excavate subsoil to required depth across pond.
3 - build clay bund with excavated subsoil around lower perimeter, compacted well onto a bare clay base
4 - set some soil to one side for use on top of liner
5 - soften pond edges to create shallow slope for wildlife and safety (<1:3)
6 - lay liner across pond base, keeping a lot of slack to avoid puncuture when soil is replaced
7 - ensure that the upper liner perimeter is level all around
8 - replace soil to a depth of 15cm across full liner or across liner edge if pond is too braod to do the work to do the work without tracking onto the lined area

Pond will fill from rainfall only and possibly from upslope runoff.
For water sources other than direct rainfall consider shed or house roof water or piped inputs from upgradient stream or drain.

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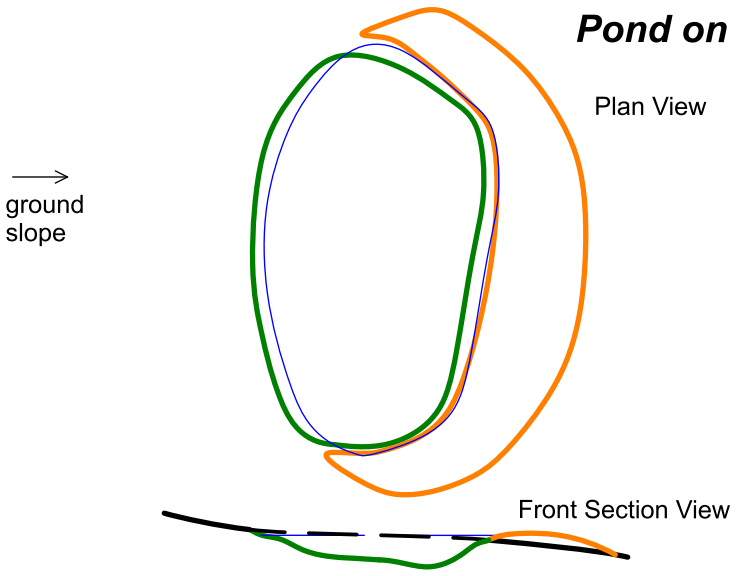
Pond creation on sloping site with heavy clay or peat soils

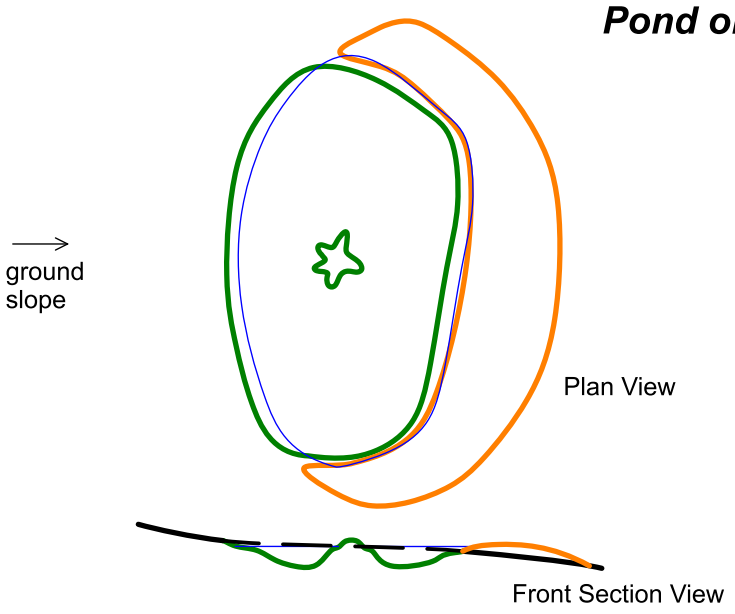
Pond on sloping site



1 - clear topsoil and vegetation from pond base and perimeter embankment base and remove to field or garden.
2 - excavate subsoil to required depth across pond.
3 - build clay bund with excavated subsoil around lower perimeter, compacted well onto a bare clay base (having removed vegetation to avoid leakage later)
4 - soften pond edges to create shallow slope for wildlife and safety (<1:3)

Pond will fill from rainfall only and possibly from upslope runoff.
Seasonal drying will occur if soil is not sufficiently impermeable
This is still ok for wildlife.
For more open water dig broader pond or raise perimeter embankment or use plastic liner if needed to hold more water.
For water sources other than direct rainfall consider shed or house roof water or piped inputs from upgradient stream or drain.

Pond on sloping site with island

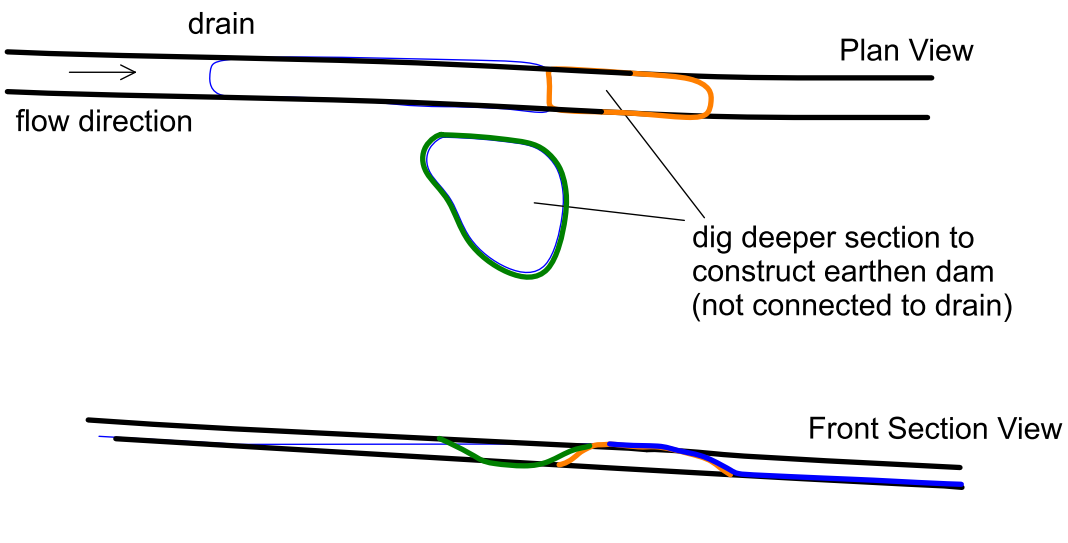


1 - clear topsoil and vegetation from pond base and perimeter embankment base and remove to field or garden.
2 - excavate subsoil to required depth across pond.
3 - build clay bund with excavated subsoil around lower perimeter, compacted well onto a bare clay base (having removed vegetation to avoid leakage later)
4 - soften pond edges to create shallow slope for wildlife and safety (<1:3)

Pond will fill from rainfall only and possibly from upslope runoff.
Seasonal drying will occur if soil is not sufficiently impermeable
This is still ok for wildlife.
For more open water dig broader pond or raise perimeter embankment or use plastic liner if needed to hold more water.
For water sources other than direct rainfall consider shed or house roof water or piped inputs from upgradient stream or drain.
Star shaped islands offer greater edge habitat and shelter for birdlife.

Pond creation in peat bog setting

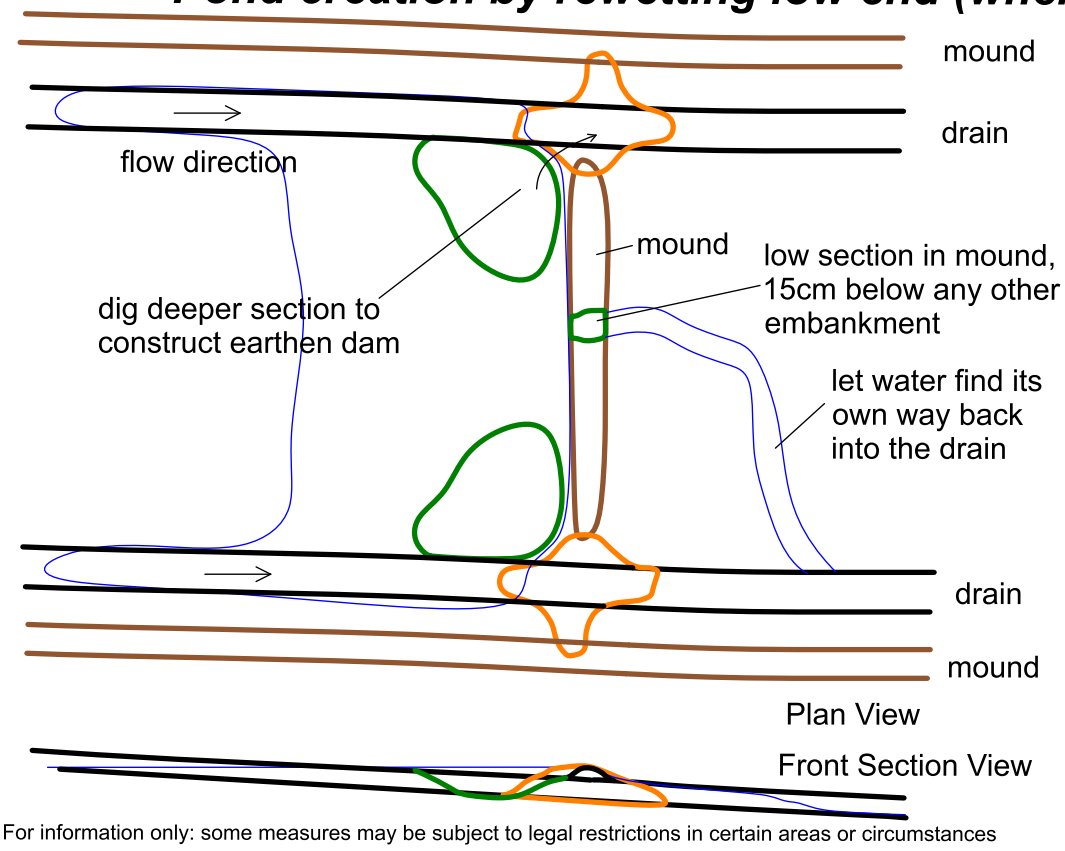
Habitat restoration by rewetting low end of drained bog channel



1 - clear vegetation from areas being worked on (both bund and pond area) and set to one side for use to cover drain bund later
2 - excavate subsoil from pond area to generate bund material
3 - build peat bund within the channel, compacted well onto a bare peat drain base (having removed vegetation to avoid leakage later)
4 - mound bund over the level of the surrounding bog
5 - cover all bare peat with vegetation and tamp well into place with digger
6 - repeat along drain to raise water level for as great an area as is available

Channels will fill from inflow and revegetate over time.
Seasonal drying may occur if bog water level drops in summer.
This is still ok for wildlife.
Explore opportunities for greater rewetting around this area to create a wider preserved bog habitat.
In all drain damming works be mindful to avoid flooding neighbouring lands.

Pond creation by rewetting low end (where all of bog is in the one ownership)



1 - clear vegetation from areas being worked on (both bund and pond area) and set to one side for use to cover drain bund later
2 - excavate subsoil from pond area to generate bund material
3 - build peat bund within the channel, compacted well onto a bare peat drain base (having removed vegetation to avoid leakage later)
4 - similarly plug any other obvious outfalls, wtih peat compacted onto peat (without vegetation to act as a conduit for water)
5 - create slight depression (15cm deep) in a selected location for new raised water exit point
6 - cover all bare peat with vegetation and tamp well into place with digger
7 - soften pond edges to create shallow slope for wildlife and safety (<1:3)

Pond will fill from inflow.
Seasonal drying may occur if bog water level drops in summer.
This is still ok for wildlife.
For more open water dig larger pond or enhance the retaining dam.
In all drain damming works be mindful to avoid flooding neighbouring lands.

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